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Editorial.

THE OFFICES of the American Institute of Mining Engineers were moved from 99 John St. to 29 West 39 St., New York, on January 1. This address indicates removal to the United Engineering Society building. We hope the affairs of the Institute may be blessed with unbroken prosperity and that the multiple activities of the veteran secretary may proceed with wonted vigor and effectiveness under the new roof.

ON THE LAST day of the year a conference was held at New York between the State Geologists and the Director of the United States Geological Survey, for the purpose of discussing the relations it is proper to maintain between the Federal bureau and those of the various States. This is the result of recent unpleasant incidents, and indicates a desire to clear a situation that promised to be complicated. We trust that the deliberations were to the benefit of economic geology, preserving the opportunity for individual research, as well as State work, while giving proper consideration to the more comprehensive investigations of the National scientific bureau.

IT APPEARS that the Federal authorities intended to use Wyoming sandstone and Indiana limestone in the erection of the new Government buildings at Los Angeles. The matter was brought to the attention of Mr. Lewis E. Aubury, the State Mineralogist, and he promptly telegraphed to Washington, protesting against this choice of building stone, there being equally good material available in California. In the quarries of Ventura, San Luis Obispo, Santa Clara, and Colusa, the contractors can obtain all that is needed. It is not obvious why the railroads should be presented with the cost of bringing stone from distant localities.

EVERY YEAR at Christmas the management and the men of the North Star mines at Grass Valley meet together in good-fellowship. The company presents each miner, from the youngest to the oldest, with a piece of gold, and the men give the manager and his assistants something to express the kindly feeling existing between them. Last week this function marked an event of greater importance, for Mr. A. D. Foote, the manager, announced that the company had voluntarily decided to adopt the eight-hour day; this included the abolition of the 'grave-yard shift'. In addressing the men, Mr. Foote expressed his confidence that just as much work would be accomplished as in the longer hours hitherto customary, and we have no doubt that this is true if the men accept the concession in good faith. Managers as a rule do not object to the eight-hour day when it yields eight hours of honest work, but in many cases it means much less, every effort being made to steal time so that

the employer does not receive what the implied contract calls for. But the best way to solve labor problems is by fair dealing on both sides, and for this reason we welcome the example of the North Star Mines Company.

AN EFFORT is being made by Messrs. C. C. Moore, H. T. Scott, and other energetic citizens of San Francisco to promote closer commercial relations between our City and the new goldfields of Nevada. This movement is worthy of support, especially as one of its objects is to secure better railroad facilities between this great seaport and the desert plateau, now the scene of widespread mining activity.

ACCORDING to *The News*, of Denver, there is a geological feature at Idaho Springs that gives that mining centre unusual "prestige," and that is "a great volcanic dike which is said to entend from New Mexico to Canada," running in some roundabout way from Goldfield, Nevada, to Cripple Creek, and then to Idaho Springs, where it blossoms in a truly magnificent manner. We do not know much about that "delirious trimmings" of a dike, but we can vouch for two streaks of metallic iron that extend down Clear Creek cañon with undeviating parallelism three feet asunder; at Denver these streaks enlarge, and traveling 4 feet 8½ inches apart they reach as far north as Cheyenne, connecting there with other streaks that go eastward to Omaha, and westward even to Goldfield, and many be the weary ones that tramp along the strike of those streaks.

ONE OF the interesting features of the past year has been the aggressive policy and growing business of the United States Smelting, Refining & Mining Company, which bought an important group of mines at Pachuca, Mexico, and secured control of the old Richmond and Eureka mines at Eureka, Nevada, besides conducting a mining and smelting business at Bingham, Utah, and in Shasta county, California, with refineries in New Jersey and Indiana. While appreciating the skill and integrity of the Guggenheim family, we regret to see their tendency to monopolize the smelting business and we welcome the growth of substantial competition. Such competition is undoubtedly beneficial to all concerned, and more especially to the owners of small mines, who in these days have good cause to be restive at the restricted market for their ore. Healthy rivalry between two large smelting corporations would be an admirable tonic for the mining industry.

THE AMALGAMATION of the Greene Copper Consolidated mine with the Cananea Central and the passing of control from Col. W. C. Greene to Mr. Thomas F. Cole and his associates is an event of special interest because Col. Greene has been so thoroughly identified with the great mine that bears his name. The change is bound to be beneficial, for while Col. Greene belongs to the type of frontiersmen that explore new regions, he is not the man either by temperament or education to direct the operations of a big copper enterprise. Greene Consolidated in the past has had an air of opera bouffe and its real mining and smelting operations have been rendered rather undignified by the market attacks and counter-attacks of a group of men among whom it is only necessary to mention Gates and Greene. Copper mining on a big scale has no place for such performances; it is an intricate business, requiring financial ability of a high order and great technical skill. The old days of picturesque promoters are bound to go and among them Col. Greene was, and happily remains, one of the most successful.

Mining Speculation in 1906.

The year just ended has seen a marked increase in speculation both on our exchanges and at London, which is the distinctive mining market of Europe. On the whole, a great deal of money must have been made, though much of it may be still on paper, for the rise in stocks has been based largely on better metal prices and upon actual discoveries of ore. In the United States the most spectacular dealings have been in the shares of mines situated at Butte, Montana, at Goldfield, Nevada, and in the Cobalt district of Ontario, but there has been a tremendous transfer of money and stocks in connection with the copper mines of Michigan, Arizona, and Utah, and the gold-mining ventures of southwestern Nevada.

At Boston, the shares in the older mines of the Lake Superior region, such as Calumet & Hecla and Wolverine, possessing assured ore reserves and careful management, have seen an advance that seems warranted; the newer companies, such as Copper Range Consolidated, Allouez, and Mohawk, have been able to fulfill expectations formed at their flotation, and the rumors of combinations to be formed among groups of adjoining mines has stimuluted dealings, especially at the close of the year. But Boston, to which transactions in Michigan copper stocks are mostly confined, has been optimistic only, not excited beyond reason, although there has been some liberal dealing in a few of the Butte stocks, such as United Copper, Butte Coalition, and North Butte. On the New York Exchange the increased dividends of Amalgamated and Anaconda have provoked the customary gambling on a large scale, but the chief centre of speculative purchases of mining stocks has been on the Curb—the peripatetic mart on Broad street. Here there have been extraordinary scenes of excitement, especially during the last three months of the year. Dealings have grown enormously and the number of stocks quoted has been increased until the list is fairly representative of the mining activity prevailing all over the North American continent. In the first half of the year the new enterprises at Butte, more particularly those corporations that were formed immediately after the Heinze-Amalgamated truce, in February, were favored by speculators; indeed, the cessation of the cat-and-dog fight between the Standard Oil copper consolidation and Mr. Heinze released a great deal of property tied by injunction and produced a most excellent effect in Montana; as it was almost contemporaneous with important discoveries of rich ore in the northern part of Butte and with the extraction of rich stuff from the bottom workings of the Anaconda mine, the general result was to give great animation to the stock market.

The extension of the Bisbee copper district and the discovery of rich orebodies in the group of mines within the 'bonanza circle,' prompted active speculation in the shares of the Calumet & Arizona, Superior & Pittsburgh, Butte & Arizona, Shattuck-Arizona, and Denn-Arizona companies, dealings being scattered over many markets, for Michigan, Montana, and Pittsburg capital was largely instrumental in financing some of these enterprises at their inception, as the names indicate. This tendency of mining men to go out of their home districts is a good feature of the year's progress. Butte money has been put into Idaho, for instance, in the Snowstorm mine and in the Mullan district. Salt Lake capital is financing several copper prospects in southern Nevada; money made from Colorado mines has won handsome returns at Tonopah and Goldfield. This means that the experience of capable mine operators is applied to the exploration of new regions and there can be no question that money from such a source is better spent than that of the clerks, policemen, and cooks that dabble on the margin of ten-cent stocks.

The development of the big copper mines at Bingham has been reflected by the quotations for several Utah stocks that are dealt in at New York and Boston, but there has been no great rise, the successful exploitations of the mines being offset by the litigation with the farmers over smelter fumes, culminating in the unfavorable decision of the local courts. Similar ore deposits at Ely have furnished the basis, together with Guggenheim control, for great doings in Nevada Copper Consolidated, a stock that rose within a year from 6 to 22¾, largely on the proof of immense bodies of ore and the completion of the railroad. Two other established copper enterprises, exploiting low-grade ores of an opposite character, namely, Tennessee Copper, in the State of that name, and Granby, in British Columbia, have figured on the share lists, but without any pyrotechnic displays, both being held by strong groups of financiers. The Californian copper mines—in Shasta county—have played no particular part in speculation, although Lawson said some things about Trinity, but to balance this state of affairs, the Fresno Copper Company, a Glasgow enterprise based upon an unhappy mine in Fresno county, California, came to a most inglorious smash, with a drop in the shares, at Glasgow, from two pounds to two shillings within a few days.

There has been a healthy market in Cripple Creek shares, but it has been confined mainly to the local exchanges, at Denver, Colorado Springs, and Cripple Creek. Drainage projects have stimulated purchases of stock and transfers of property, fires, and flooding of workings have enlivened the market. At Salt Lake there has been an increased business on the local bourse, but dealings in the big mines have been made on the Eastern exchanges, and the local speculative movements have been without unusual features. In fact, the new centre of the spirit to get rich quickly by means of the buying and selling of mining shares has been further west. The gambling in Nevada stocks has been the most notable feature of the year.

Discoveries of extremely rich ore in the young mines of Goldfield, successful developments in the slightly older properties at Tonopah, and the finding of rich outcrops in a score of camps scattered over the Nevada desert, created a speculative fever that even the tremendous destruction of property by the San Francisco disaster was unable to check, save for a few days. Shares of all kinds have risen to many times their former price, and in the case of the Mohawk, a stock that sold for $2 in August rose to $20 in November. The prominence given to episodes of this kind tended to make a market for a number of cheap shares, based upon untried prospects, capitalized for large sums, and recommended in flamboyant advertisements. Much of this was fraudulent, but so much of it was based on real discoveries of ore that, in face of the public haste to gamble, there was no effort to make nice distinctions. At the close of the year, the occurrence of copper on the edge of Death Valley, at Greenwater, was made the excuse for several preposterous promotions, a capital of one or even two million dollars being saddled upon mere outcrops of low-grade stuff. It will take a lot of sober work and honest mining to cure the effects of this speculative debauch and, while a famous development of the desert region has undoubtedly taken place, the present year will have to pay the debt incurred during 1906.

Contemporaneous with the Nevada boom there was a wild orgy of speculation on the curb at New York, chiefly in shares of mines at Cobalt, the new camp in Ontario. Nipissing, which had been put on the market in May at $4¼ rose to $34, for 1,200,000 shares, on fabulous finds of silver and on the statement that the Guggenheims had bought control. When the last mentioned transaction fell through, there was a collapse and shares fell to 12. When Nipissing began to boom last summer a score of other Cobalt mines appeared on the curb market and many of these were boosted most successfully. Up to the first of December, the capitalization of Cobalt companies had reached $200,000,000, while all the ore produced by the district from the discovery to that date barely represented $5,000,000. Even after the Nipissing fiasco, the business of incorporation went on merrily. In the last week of December seventeen companies with an aggregate capital of $17,150,000 were incorporated in this district mainly on a slender showing of ore in prospect holes.

In conclusion, if we omit the absurdities marking the extreme forms of the essentially human desire to make money without work, it can be said that the speculative spirit of 1906 has been largely of a productive nature. Below the frothy talk and reckless doings of the irresponsible promoter and his easy victims, there has been a broad foundation of exploration and development. An adventurous spirit is needed in mining, which is a great quest for gold or the other metals, for without it the industry would soon shrivel to insignificant dimensions. During the past year there has been a tremendous uncovering of ore and extension of mining territory, especially in America, and the fruits of it will be manifest in the statistics of the future. Humanity being liable to error, especially when excited, there has been much money misapplied, but, having regard to the booms of other days, when greater extravagances and follies were perpetrated, we conclude that 1906 has seen good use of speculation as applied to mining.

Special Correspondence.

Butte, Montana.

Annual Statistics.—A Notable Increase in Copper Production.—Application of Electricity at Mines and Smelters.—The Coal Production of Montana.—Butte & Bacorn.—The Homestake Meeting.—General Development Co.—Lead Ore Produced.—The Butte & London.—Other New Companies Doing Exploratory Work.

In December the Butte district produced 27,491,420 lb. copper, making a total for the calendar year of nearly 343,000,000 lb. The various companies contributed to the year's production as follows:

Name of company.	Pounds of copper.
Boston & Montana	93,461,344
Anaconda	95,997,440
Butte & Boston	15,783,000
Washoe	12,700,000
Parrot	9,659,000
Trenton	13,398,400
North Butte	37,500,000
Butte Coalition	22,113,000
United Copper	7,400,000
Original	17,000,000
East Butte	7,200,000
Pittsburgh & Montana	4,753,500
LaFrance	2,790,000
Goldsmith	2,053,125
East Butte Extension	360,000
Lessees	520,000
Total	342,688,809

In 1905 Montana produced 320,000,000 lb. copper, so that there has been an increase of 33,500,000 lb. Butte copper ores yield, as a by-product, 2½ to 3 cents worth of silver for each pound of copper, making a total silver value of about $10,000,000 on the year's output. Some gold is also recovered.

To the December output the different companies contributed as follows:

Name of company.	Tons of ore.	Pounds of copper.	Yield per ton lb.
Boston & Montana	99,200	7,440,000	75
Anaconda	102,300	7,467,900	73
Butte & Boston	17,670	1,236,900	70
Washoe	14,260	998,200	70
Parrot	8,525	511,500	60
Trenton	15,190	987,350	65
North Butte	34,100	3,410,000	100
Coalition	31,000	2,232,000	72
Original	21,700	1,302,000	60
East Butte	6,820	613,800	90
Pittsburgh & Montana	4,340	338,520	78
LaFrance	6,975	488,250	75
Miscellaneous	6,200	465,000	70
Totals	368,280	27,491,420	

The Boston & Montana Co. will equip the Leonard mine with the electric haulage system and later on a similar change will be made at their other mines. Three locomotives will be placed in the Leonard, one on the 800-ft. level, one on the 1,100, and the third on the 1,400. The haul on these levels is long, 17 horses now being employed to do the work. It is expected that with the electric locomotives twice as much ore can be hauled in half the time. The locomotives and new cars have been ordered and will be delivered in March.——The Butte & Superior Co. has started sinking the shaft on the Black Rock, which was recently re-timbered to a depth of 500 ft. The shaft will be taken to the 1,000-ft. point without a stop.

The Amalgamated Co. is preparing to substitute electricity for steam in many of its mines, and also in its smelter at Anaconda. The mines are now undergoing the equipment necessary for the change. Many of the mine-pumps and air-compressors, as well as the concentrator at the smelter, will be run by electricity. The Missouri River Power Co. which furnishes power to the Amalgamated mines, is enlarging its plant and distributing lines and will furnish the Amalgamated mines with 17,000 h.p. in a few months. The use of electricity will not only mean a great saving to the Amalgamated Co., but will do away with the constant danger of a forced shut-down through shortage of coal.

According to the report of the State coal mine inspector, Montana has 32,000,000 square miles of coal lands and during the year mined 2,000,000 tons of coal. There are but three counties in which coal has not been discovered. The greatest percentage of the output is consumed by the Amalgamated Copper Co., the Great Northern, Northern Pacific & Butte, Anaconda & Pacific railroads. The largest continuous area of coal is embraced in the Great Falls field, which includes the Belt coal mines of the Anaconda Co. In the eastern portion of the State there is a great field of lignite, underlying several counties, varying in thickness up to 20 ft. A number of neighborhood mines have been opened and from them the people take their fuel as they need it, without charge.

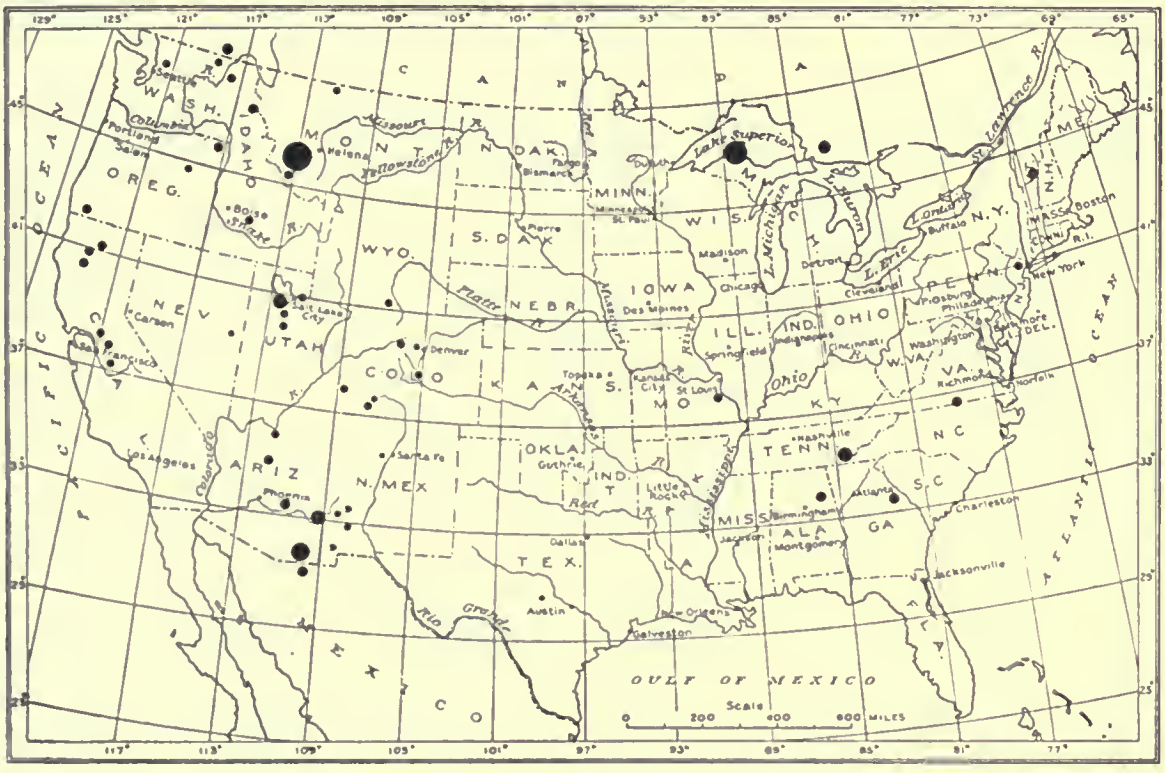
The Butte & Bacorn Mining Co. has cut another wide vein south of the 500-ft. station of the Calumet shaft. The vein is about 40 ft. wide and was cut 140 ft. south of the shaft. Although the ore contains silver and copper, it is not rich enough to be worked. The vein is practically dry, which convinces the manager and other mining men who have examined the strike that rich ore will be found when the water-level is reached. The company is now driving on a 17-ft. vein that was cut north of the Calumet shaft several weeks ago. In the north vein assays have shown 5 oz. silver and 1½% copper. Drifts are being advanced on the north vein and the ground is looking well. The manager, F. W. Bacorn, will soon resume sinking on the Calumet and take both that and the shaft on the Belinda claim down to the 1,000-ft. point before any more cross-cutting is done. The Belinda shaft is now down 615 ft. There are several more veins between the Calumet and Belinda shafts, that will be cut by a cross-cut between the two shafts. It was not expected that orebodies would be found above a depth of 700 to 800 feet.

The Homestake Mining Co., which owns some gold claims and several developed mines northwest of Butte in what is known as Brown's gulch, will have a meeting of stockholders on January 8, when a proposal will be submitted to make the stock assessable. The company is capitalized for $1,000,000, and has some good property, from which a lot of ore was mined a few years ago. For want of capital, however, to open the orebodies properly, no work has been done on the properties for several years. The company owns five claims in one group and five in another, and also owns a millsite and a small mill. Ore running as high as $551 per ton has been shipped from the property, and it has been the opinion of some of the stockholders that if a good manager could be placed in charge it could be made dividend-paying. The immediate purpose of making the stock assessable is to raise money with which to pay taxes and do some annual representation work on some of the unpatented claims. The property has been opened by three adits, one 380 ft., another 280, and the third 190 ft. long.

The stockholders of the Reins Copper Co. will hold a special meeting in Butte on January 31 for the purpose of voting on a proposal to increase the capital stock of the company from 1,000,000 shares to 2,000,000 shares. The call for the special meeting has been issued by Col. Guffey and his Pittsburg associates in the company. It is stated that the increase in the capital stock is for the purpose of buying additional property and providing more working capital. The Reins Co. recently purchased a fractional claim from the Ella Mining Co., paying therefor $240,000, which has been regarded locally as a very good price. It is stated the company has other ground under negotiation. For five or six years Col. Guffey and his associates

have been putting up money for expensive exploration work in the Combination mine. A small vein was recently opened and some ore is being mined from it.—— The General Development Co. of the Lewisohns is sinking three exploration shafts in different parts of the Butte district, one on the Granite Mountain claim, situated near the Jesse mine of the North Butte Co.; one on the Montgomery, south of the Bullwhacker claim, and the third on a piece of ground near the property of the East Butte Co., in the southeastern part of the district. The last mentioned and the Montgomery shaft will not be sunk more than a few hundred feet, but the shaft on the Granite Mountain is to be put down 1,000 ft. or more.—— The Colusa-Leonard Extension Co. has been financed by Eastern capital and is said to have sufficient backing to thoroughly develop its ground on the east side, where it owns 47 acres in a square block, just east of the Colusa and Leonard mines of the Boston & Montana Co. The shaft has already reached a depth of 100 ft., and is well timbered. It is expected that bedrock will be found at a depth of about 200 ft. The work is under the direction of Matt MacPherson, an experienced miner, and he is making exceptionally good progress in sinking the shaft.

The Goldsmith Co. is mining in the Little Georgia and Goldsmith mines and is making regular shipments of ore to the East Helena smelter. The ore runs high in gold and silver and about 4% copper. About 3,000 tons of ore per month are shipped from Butte mines to East Helena, mostly by lessees, who are working in the Alice, Moulton, Allie Brown, and other properties in the same neighborhood. The Allie Brown, which is owned by La France Co., is a lead producer, and one of the few lead mines in the Butte district.——The Butte & London Co. is engaged in cutting a station at 800 ft., and while that is being done sinking has been suspended, but it will be resumed next month. The station will be 50 ft. long, 12 ft. wide, and 10 ft. high, giving the room necessary for a pump of 1,000 gal. capacity. The rock is very hard and progress is slow. The shaft will be taken to 1,000 ft. and then a cross-cut will be started.——The Butte & Summit Valley Co., which is developing the Saratoga group of claims southeast of Butte, has encountered several stringers of copper ore in a cross-cut south from the 250-ft. station; this is taken to indicate that the vein is not far distant.——The Alliance Copper Co. has decided to sink its shaft another 100 ft., but before the work is started a heavier hoisting engine will be erected. The purpose of sinking is to tap the vein opened at the 200-ft. level and secure 100 ft. of stoping ground. The company owns 1,000 ft. on the vein.



Distribution of Copper Mines in the United States.

Cripple Creek, Colorado.

Annual Review.— Many Mines Worked Under Lease.— Successful Operations.— New Cyanide Mills.— Popularity of Cyanidation.— Transfers of Property.— The Drainage Adit.— Reduction in Rates of Treatment.

The principal feature of mining in this district during 1906 has been the large amount of systematic leasing of properties. Several of the mines are given over entirely to lessees, others partially, while only a few properties, such as the Portland and Strong on Battle mountain, and the Cresson on Bull hill, are worked entirely on company account. It has been rumored several times that the Portland Gold Mining Co. is about to lease its property, but the reports have been denied each time by the president of the company. One of the leases that has produced so well is that of F. R. Marsh and John Hodges on the Little Chara claim of the Work Co.'s property on Raven hill. Operations are conducted through the Moffat tunnel at a distance of over 2,000 ft. from the mouth. The lessees have made a profit of approximately $500,000. Soon after rich ore was struck by them, suit was brought by E. J. Knight, of Colorado Springs, for an $11/32$ interest in the profits; he lost his case in the District Court, and has now appealed to the United States Court at Denver.

The Western Investment Co. has operated several leases in the district during the year. On the Specimen and Sacramento claims of the Stratton Estate, situated on the southeast slope of Bull hill, a good-sized vein was encountered, which has produced a large tonnage of ore that gave returns of several ounces in gold. The same company also made good profits on La Bella lease of

the Golden Cycle mine, and also on Vindicator No. 11. The lease of Lew Hayden on the Gregory of the Elkton Consolidated Gold Mining Co. was also one of the best of the year. It expired in March last, but up to that time had made a profit of around a quarter of a million for the lessees.

The erection of cyanide mills for the treatment of the low-grade oxidized ores of the district has been an important feature. The Golden Cycle Mining Co. acquired the old Telluride mill from the General Metals Co. at Colorado City, which has been re-modeled to accommodate the cyanide process under the direction of Philip Argall of Denver. This mill, which will have a capacity of 250 tons per day, will soon be ready for work. Ore is already being sampled and stored for future treatment. The Isabella Gold Mining Co., on Bull hill, has erected a mill, which is now in operation for the treatment of their low-grade ores in the mine and on the dump. Other mills operating in the district are the Ironclad, situated on the hill of that name, being the smaller of the two Homestake plants; also the Anaconda, Home Run, Wild Horse, Pony Gulch, and Van Fleet mills. The Vindicator Consolidated Gold Mining Co. is erecting a small mill, at the present time, in the Lillie shaft-house, which belongs to that company. Low-grade ores running from $4 to $10 per ton will be handled, as well as sulphide ores, for the treatment of which an Edwards roaster has been installed. At the annual meeting of Stratton's Independence, Ltd., held at London on December 19, the erection of a mill on the company's property on Battle mountain was considered. Elaborate sampling of the mine and dump has been carried on this year to determine the quantity and value of the ore available for treating by cyaniding processes. The results were encouraging. Now that most of the mines have got to a stage where the greater part of the ore is low grade, ranging between $4 and $12 per ton, the cyanide process and its modifications seem to be the only means by which this ore may be treated at a profit.

During the year some important transfers of property have been made. The most important is the sale of the claims of the United Gold Mines Co., of the Woods Investment Co., to the Golden Cycle Mining Co. The purchase price was in the neighborhood of $350,000. The claims include the Wild Horse, Deadwood, Damon, Hardwood, Trachyte, Silver Tip, and the W. P. H. The Dillon property on Battle mountain, formerly under lease to Jesse Waters and John Price, has been bought by the Granite Gold Mining Co., whose property it adjoins on the west. The purchase price was stated at $160,000. The Granite Co. also acquired in the early part of the year the Gold Coin mine of the Woods Investment Co. The main output of the Granite mine had been hoisted for some time previously under contract through the Gold Coin shaft, which gave better facilities for the development and operating of that mine. The Trilby mine on Bull hill has recently been bought by Pittsburg and Philadelphia capitalists from the Moose Gold Mining Co. This property has produced some very rich ore at times, being leased intermittently up to the time of sale. Extensive development will now be done by the Eastern people.

The deep drainage project which has been brought before the public several times during the past year seems now a certainty. One million dollars has been subscribed by the mine owners of the district and as soon as the work is started, which will be during the month of January, subscriptions, it is hoped, will be obtained from the mills, smelters, and railroads. The place of commencing the adit is yet to be decided, but it will be either the Gatch Park or Window Rock sites.

The recent reduction in the open rates of freight and treatment charged by the smelter trust will benefit the camp to a great extent during the coming year. The difference of approximately $2 per ton will help materially in making a profitable market for the lower grade ores of the Cripple Creek district.

Johannesburg, Transvaal.

Too Much Politics.—The Chinese Question.—Passing of Dividends.—Loss of Confidence in the Rand.—Two Shafts Necessary.—Centralization of Management.

The dreary days of depression are being lit up by the fire-works sent off by the different political organizations. One is reminded of the stirring days of the 1896 campaign in the United States, over free silver. Gold versus silver is not the point at issue here. A purely industrial question, the question of Chinese labor, has been dragged into the arena of politics, and is being attacked and defended in a way never witnessed before in this country. The anti-Chinese brigade is still in the minority, but they are exceedingly bitter, and being opportunists they will join hands with Het Volk (the Dutch party), or any other party that will pledge itself to send the Chinese out of the country. There is going to be a terrific battle, during the next few months, over the Chinese question. Who will come out on top, it is exceedingly difficult to say. Personally I think the coolies will remain. Should the extremists get control of affairs, and insist on the immediate repatriation of the Chinese, then all I can say is, God help the Rand. Nearly half the mines will be forced to close down.

On account of the uncertainty of the future, a number of big corporations at their annual meetings have decided not to pay the usual dividends this year. It is possible that many of the mines will close down, if the Chinese are sent away, and as it is almost impossible to raise any money at the present time for future use, it is necessary to have large sums in the banks to meet the dark days that are possibly coming. There are strong rumors that several important deep-level propositions that are in the development stage will soon be forced to close down, on account of the shortness of cash. To issue reserved stock at the present time, for the purpose of procuring sufficient cash to continue operations, is almost impossible, as few people are buying South African shares.

There is no question that the financial side of the Rand is in a sad state. Anyone who will compare the prices of shares today with what they were two years ago will be appalled at the huge depreciation in value. There is little doubt that Europe as a whole has lost faith in the Transvaal. While there have been frauds, and grievous mistakes, this loss of confidence is not altogether justified. The output has reached a high figure, and the dividends paid by the better class mines are satisfactory. The loss of confidence is undoubtedly due to the feeling of uncertainty about the future. To send the Chinese away, close down half the mines, and heap more taxes onto the other mines, is certainly not the way to attract the investing public in England and the Continent. If things are bad with Chinese, what would they be without them!

The Government has appointed a commission to inquire into the subject of one shaft as against two, for deep level mines. At the present time the law requires a mine to have two shafts, or an opening into a neighboring mine, before a property can mine ore from stopes on a large scale. Several mines have been hard hit by this law. They have put down one shaft to develop a section of their mine, and as there are no openings near-by with which to connect, they have been forced either to cease mining, or sink another shaft. They have decided to

stop work. The report of the commission will be awaited with keen interest. Probably recommendations of exemption will be made, provided the mine with one shaft puts in forced ventilation, and uses steel head-gears, with the first few sets in the shaft of steel, to reduce the danger of a fire to a minimum.

The discussion over centralization of management has quieted down. It is rather extraordinary that the group where the centralization idea is carried to an extreme has the highest working costs on the Rand, in spite of very favorable conditions. On this group none of the individual mines have resident managers. One man is appointed to look after one department on each property. There is no supreme authority at any one mine. This explains the high working costs.

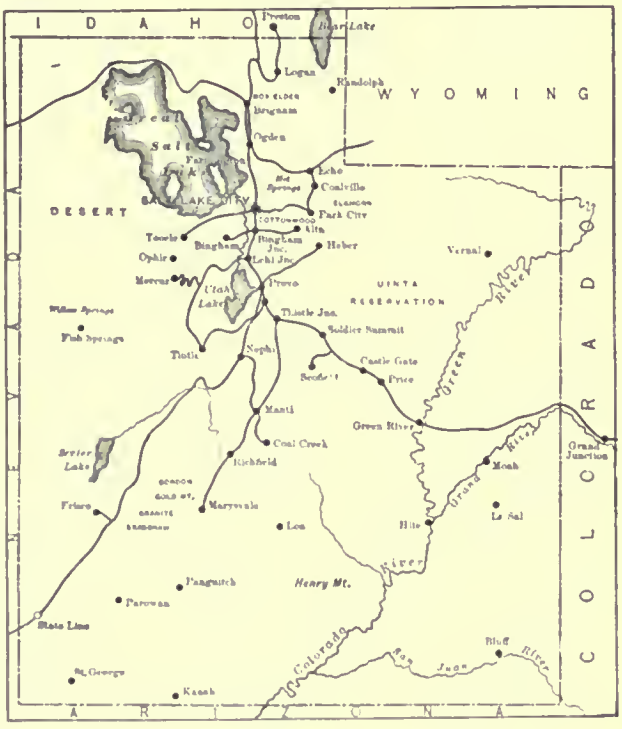
Salt Lake City, Utah.

Annual Review.—General Progress and Prosperity.—Smelter Fume Troubles.—Bingham Highly Productive.—Important Improvements.—Tintic Development.—Deep Mining.—Park City Hindered by Cave in Ontario Adit.—Record of Shipments.—The Alta District.—Mercur and Its Mines.—Stockton.—A New Gold Camp.—Other Promising Localities.—Record of Dividends.—Total Output of the State.

The year 1906 has been the most prosperous in Utah's history. Not only is this true as far as mining is concerned; but it also applies to every other kind of industry. The mining situation has improved particularly and I know of no better way to demonstrate this than to refer to the record giving the production of metals as well as to the table showing the dividends disbursed. There is no doubt expressed but that the present rate of progress will be as maintained in the new year, but it is just possible that the production of metals during 1907 will not come up to that of 1906 for the reason that an injunction issued from the Federal Court may compel several smelting companies to cease, or at least curtail, their operations as a result of the complaints made by the farmers in the southern part of Salt Lake county against smelter smoke. At least three of the smelting companies have decided to go elsewhere to conduct their operations, even if the Court should make some modification in its decree, which is declared to be about as drastic as could be, for it practically forbids the treatment of any ore mixture in a charge containing more than 10% sulphur. The smelting companies that are defendants in this case promptly made application for an appeal and, pending disposal by the higher tribunal, they are operating as usual under bonds of $100,000 each. It is expected that the case will be reached in June, when the smelters will have to close, should the decision of the lower court be affirmed. However, great hopes are entertained that some arrangement will be brought about whereby the existing plants will be allowed to continue until such time as new ones are completed and ready for operation, so as to work no serious hardship upon the owners of producing mines or those who are dependent upon them for support.

Bingham is the big mining camp of the State at the present time and is likely to bear that distinction for a good many years to come. While its mines are principally productive of copper, lead continues to be produced.

The ore sent to the smelters during the past twelve months has averaged between 4,000 and 5,000 tons, and employment has been given to about 4,000 men, meaning a monthly expenditure in wages approximating $425,000. An immense amount of capital has been invested in the Bingham district and in most instances mining is conducted there upon a large scale. The most striking example of this is found in the work of the Utah Copper and Boston Consolidated companies, which now have under construction at Garfield, 15 miles west of Salt Lake City, two concentrating mills. Both will be completed during 1907; the former is being built to treat 6,000 and the latter 3,000 tons of the low-grade monzonite copper ores characteristic of Bingham. Both the companies mentioned have introduced steam-shovel practice and for several months past stripping of the overburden has been in progress. The Boston Con. has two shovels of the type used in digging the Panama canal and two others will be placed in commission during the next few weeks. The Utah Copper has been working with a smaller shovel, which has not met with the success credited to those used by its neighbor; this company has three shovels in its equipment and it is understood that they will shortly be replaced by larger machines. To make provision for the increased tonnage that the mines at Bingham will send to Garfield, the Rio Grande Western railroad has double-tracked its line into the camp and built a 'high line' to the principal mines; a branch has also



Utah.

been built to the mills mentioned and to the smelter of the American Smelting & Refining Co. This railroad construction has been costly, as it has involved heavy rock-work and some difficult engineering features.

An important event affecting Bingham was the purchase by F. Augustus Heinze of a controlling interest in the Bingham Consolidated Mining & Smelting and, subsequently, in the Ohio Copper company. In securing the latter property, Mr. Heinze has acquired a mine of great value; while it contains a vast amount of sulphide ore, it also takes in a portion of the monzonite zone. Mr. Heinze has announced his intention to provide the Ohio with a milling plant of probably 2,000 tons daily capacity.—— The Utah Apex Co. has been conducting important development work, a feature of which is the driving of a deep adit, to tap the orebodies from 800 to 1,000 ft. under the surface and to form the main entrance into the mine. The company has made provision for an increased output by the construction of an aerial tramway to operate between the mouth of the Andy adit and Carr Fork gulch, pending the completion of the lower adit. The ore deposits of the Utah Apex are not as extensive as those in some other mines in the district, but none have been productive of better ore. The interests controlling the Apex and Utah Development com-

panies have organized the Markham Gulch Milling Co., which is now erecting a concentrating mill at the lower end of the camp. The Utah Development Co., which was formed with the New Red Wing mine as a basis, has recently acquired the Butler Liberal mine. Development during the year has given very satisfactory results.

The Utah Consolidated has greatly increased its ore reserves during the past six months and heads the dividend list in Utah. The company has produced about 19,000,000 lb. copper this year at a cost of a little less than five cents per pound. The directors recently decided to spend a million dollars in the construction of a new smelting plant and, in addition to the treatment of its own ores, the company will engage in custom work. The Utah Consolidated is one of those that will go outside the Salt Lake valley to conduct its future smelting operations.—The Bingham Consolidated has carried on an active campaign of ore extraction and development in its Commercial and Dalton & Lark mines, so that the management is able to report that the ore reserves in both mines have been largely augmented.——The United States Co. has kept up the usual production from its properties. The mines of lesser importance that supplied the market with ore were the Fortuna, Montezuma, Last Chance, New England, Standard Copper, and several others. The Bingham-New Haven company paid its initial dividend of $22,600. The Yampa Smelting Co., operating the only smelter in the camp of Bingham, has added to its equipment and has greatly increased the output of its mine.

Next to Bingham, the Tintic district is the most important in Utah. All told, about 7,700 cars of ore have been dispatched from the mines to the smelters and figuring 50 tons as a basis, that means that the output of the camp has been 385,000 tons, or a little better than 1,000 tons per day. Tintic has won the distinction of having more dividend-paying mines than any other district in the State, the Beck Tunnel Consolidated leading with $325,000. It also has the deepest mine in Utah. Deep mining has been the real feature of the year's work, and the results have been most gratifying, proving that the orebodies of the district continue profitable to a great depth. This has been demonstrated in the Centennial Eureka, Mammoth, Lower Mammoth, Eagle & Blue Bell, and Gemini mines. The steady advance in the price of the metals has helped to stimulate mining activity in the Tintic district, more so perhaps, than in any other camp in Utah for the reason that the leasing system has been conducted successfully in many of the older mines, some of which had been idle for a number of years. Leasing was first tried in the old Bullion Beck mine, which has again appeared on the dividend list. Others followed, and through this means new and important orebodies have been discovered. About a month ago the Tintic Smelting Co. was formed; it is backed by some of the strongest mining and financial interests in Utah, and will build a lead smelter in the district, thus affording facilities for the treatment of low-grade ores on the spot.

The output of Park City this year has been approximately 120,000 tons of ore, the mines contributing being: Silver King, 39,915; Ontario, 5,210; Daly-West, 33,600; Daly-Judge, 33,500; Kearns-Keith, 2,330; New York, 350; Jupiter, 320; Odin, 50; Scottish Chief, 100; Little Bell, 5,500; American Flag, 2,639; other properties, 950 tons. Although Park City has been greatly handicapped on account of the caving of the Ontario adit (which occurred about 22 months ago), new developments made in portions of the district not affected have more than offset the evil consequences of this disaster. Although the Ontario company has been energetic in the efforts to re-open the adit, it may take many months yet to clear out the debris and let loose the pent-up waters. Until this is accomplished, nothing can be done toward further ore extraction or exploitation on the lower levels of several of the principal mines. The most important developments of this year have been recorded in the Daly-Judge mine. This company began the year with an indebtedness of $219,000, which has been entirely liquidated, and the treasury of the corporation now contains over $300,000. An initial quarterly dividend of $112,500 will be paid on January 12. New discoveries of a most gratifying character have been made along Bonanza Flat, Thayne's cañon, and Snake creek. Negotiations are pending for the purchase of a control of the Ontario and Daly mines by Jacob E. Bamberger, president of the Daly-West Mining Co., and it is believed that the deal is approaching a consummation.

In the Little Cottonwood, or Alta district, good progress has been made, and the coming year will see the output greatly increased. The Columbus Consolidated Mining Co., which owns the principal mine of the camp, has announced its initial dividend for payment in January, the amount being $45,000. The old Flagstaff and Emma properties, which gave this locality such prominence in the early days, have changed hands, the former becoming the property of the Con. Flagstaff Mining Co., and the latter of the Emma Copper Co. Another important deal was the consolidation of the South Columbus and Alta Quincy mines, and the organization of the South Columbus Con., all of which will be shipping mines next year. The City Rocks and Albion are also important mines, which belong to the shipping class. The Albion will be provided with a mill in 1907. There is a movement on foot to secure railroad facilities for the district. Just over the Wasatch range from Alta, and in the Big Cottonwood district, the Mountain Lake Copper, and Big Cottonwood Gold & Copper companies have developed some promising bodies of copper ore.

At Mercur, the Consolidated Mercur Gold Mines Co. continues to be the principal producer. The only other property of any consequence is the Sacramento, which produced about 5,000 oz. gold and 1,276 flasks of quicksilver. The Consolidated Mercur is a low-grade gold proposition and the ores must be handled upon a large scale to be profitable. The average value of the ore treated during the past year was $3.76 per ton and the residue in the tailing was brought down to about $1 per ton. G. H. Dern, the manager, and W. T. Janney, the company's chief metallurgist, after a series of experiments, have reached the conclusion that through a specially constructed slime contrivance, at least 50 cents per ton more can be extracted from the tailing. The directors have ordered the construction of a plant that will cost $25,000. Owing to coal shortage in December the output of the mine was below the normal.

The silver-lead mines at Stockton have been active and ore shipments have been made from the new Stockton Honerine, and Black Diamond mines. The milling plants of the first two were operated a portion of the year. In Park Valley, the Century Mining Co. has conducted the most vigorous campaign and has a good bullion record to its credit. At Ophir, the Ophir Hill mine, owned by W. A. Clark, has maintained its normal output, while the Cliff Mining Co., which took over the Buckhorn mine in the early part of the year, has been an intermittent shipper. This company has built an aerial tramway and is prepared to increase its output at once. In the southwestern part of the State the Utah & Eastern Copper Co. is operating successfully the Dixie mine near St. George. The ore is smelted at the company's own smelter at Shem City.

A new gold camp has been opened in the western part of Iron county and is known as Gold Springs. The camp

contains a population of about 100 people. The Jenny Gold Mining Co. owns the principal property and has a mill in course of construction. Stateline shows improvement over a year ago. Considerable property has changed hands there lately, Los Angeles parties figuring conspicuously in the deals. Some promising lead-copper properties have been developed in the Sierra Madre mining district, near Ogden, and in the Deep Creek district in the western part of Juab and Tooele counties. The coming year will witness unusual mining activity. The construction of the Western Pacific railroad west from Salt Lake and the probable building within the next year of a branch of the San Pedro, Los Angeles & Salt Lake railroad to Ely, Nevada, has had the effect of turning attention that way.

The Gold Mountain district has two producing mines of some note—the Annie Laurie and Sevier Consolidated. The latter is equipped with a new cyanide mill able to treat 100 tons of ore per day. Outside of these mines mining operations in this district are limited. A new

Map of Arizona.

copper smelter, the property of the Utah Smelting Co., has been established near Ogden; it is equipped to treat 200 tons of ore per day.

According to the latest estimates reported by the various metal buying and selling agencies the following is the result of the year's operations:

Gold 476,976 oz. at $20.67 per oz.	$ 9,851,091
Silver, 15,981,315 oz., at 66.585c. per oz.	10,629,546
Copper, 67,303,367 lb. at 18.95c. per lb.	12,744,988
Lead, 115,018,811 lb., at 3.635 per 100 lb.	4,480,310
Zinc, 6,472,734 lb., at $6.153 per 100 lb.	398,267
Quicksilver, 1,276 flasks at $42.50 per flask	54,188
Total	$38,161,393

Owing to the fact that it has been impossible to properly segregate some ores coming from adjoining States it is not proper that all the metals shown in the foregoing should be credited to Utah mines. The ore-selling agencies indicate that the approximate amount belonging to other States should be at least $5,000,000, leaving to Utah mines a balance of a little more than $33,000,000.

Dividends were disbursed by 22 mining companies in Utah during 1906 as follows:

At Tintic; Beck Tunnel Con., $325,000; Bullion Beck, $40,000; Carisa, $30,000; Gemini, $200,000; Grand Central, $187,000; Mammoth, $140,000; Mountain View, $12,554; Swansea, $18,000; Uncle Sam Consolidated, $50,000; Victoria, $125,000; Yankee Con, $42,500.

At Bingham; Utah Con., $1,350,000; West Mountain Placer, $2,483; Bingham-New Haven, $22,600; Petro, $32,000.

At Park City; Silver King, $800,000; Daly West, $432,000.

At Fish Springs; Utah mine, $34,000.

At Mercur; Consolidated Mercur, $100,000; Sacramento, $40,000.

At Bingham and Tintic; United States, $1,099,907.

At Frisco; Horn Silver, $80,000.

Bisbee, Arizona.

The Discovery in the Denn-Arizona.—Another in the Hoatson Shaft.—Scarcity of Fuel at Mines and Smelters.—New Appointments.—Progress at Tombstone.

From the standpoint of discovery the past three weeks have constituted a brilliant period in the history of the Warren district, because during that time orebodies were found in two different shafts, which will add two more mines to the list of producers. The strike of ore at the Denn-Arizona shaft, and the subsequent proof of a rich deposit, occupied local attention for a couple of weeks, but during the past few days interest has been centred in the opening up of an orebody at the Hoatson shaft of the Superior & Pittsburgh property. On Monday morning a round of shots exposed a half-face of oxide and carbonate ore on the 1,100-ft. level of the Hoatson. The ore came in such a way that it was evident a mass of it had been found, and on the very next round the full width of the drift was in ore. Work was pushed, and on Wednesday morning a cross-drift, at an angle of 50° to the one in which ore was first cut, broke into a full face of the same stuff. Both drifts are still in the formation, and judging from the nature of the ore, and the trend, the management feels confident that a body of large dimensions has been discovered. At the Denn-Arizona, 51 ft. of ore have been passed through on the 1,000-ft. level, and the last 19 ft. have averaged a little over 16% copper. About the time that the ore was encountered on the level, the shaft had reached the 1,100-ft. mark, and a shift of men went to work immediately to cut a station from which a drift will be run to tap the orebody at the lower level. The station is about completed, and within a few days the drift will be started in a southerly direction.

At the Shattuck-Arizona the production is being increased, and it is estimated that the smelter returns for December will show a total of 1,250,000 lb. copper. The new office building, to take the place of the one destroyed by fire, has been completed, and is now in use. The Allis-Chalmers hoist is in operation, and giving entire satisfaction. At the Copper Queen property, the scarcity of fuel has caused embarrassment, and it was found necessary to close down the shafts on the first three days of the week. A limited supply of coal arrived on Wednesday, and by practising the strictest economy it has been possible to keep all of the shafts going since that time. The machinery that was in use at the old Holbrook shaft, when it caved several months ago, is now being removed to the new shaft, and it is believed that it will be possible to hoist ore within the next three weeks.——The scarcity of fuel has also been felt at the smelters at Douglas, but on Friday the management of the Copper Queen Co. stated that there was enough oil on hand to supply their reduction plant for six days, and that an additional supply was assured.——The appointment of L. D. Ricketts as manager for the Greene-Cananea Co. and his consequent resignation from the active management of the

Old Dominion Company at Globe, has caused a report locally to the effect that Gerald Sherman, assistant superintendent of the Copper Queen Co., will take charge of affairs at Globe. While the appointment would not be a surprise, as Mr. Sherman has proved himself an able man, no confirmation from an official source can be obtained.

The Chiricahuaua Development Co.'s property in the Paradise district will be operated again in the near future by a company in which Thos. F. Cole will have a controlling interest. —— In the Huachuca mountains, development work is being prosecuted, but nothing unusual has occurred. At the Empire State property, north of Bisbee, the tunnel has been driven into lode-matter and iron ore, which has always been considered a good indication. —— Reports from Tombstone are to the effect that everything is progressing about the same as usual, and a small increase in production is promised for this month. The new battery of boilers that was erected a couple of months ago has proved adequate to handle the water, and development work is being prosecuted under correspondingly better conditions.

Mexico City.

The Greene-Cananea Merger.— Other Deals on Foot.— Government Control of Railroads.— A Big Consolidation.— Importance to the Mining Districts.

Great as has become the Greene Consolidated Copper Co. in its seven years of existence, and development work by which it has become one of the greatest copper properties in the world, and adding to the marketable supply of that metal at the rate of 6,000,000 lb. per annum, its outlook for an even more brilliant future has certainly been assured by the merger, which was consummated by the Greene company's vote of approval on December 18, whereby the Greene Consolidated Copper Co. and the Cananea Central Copper Co. have become one company, known as the Greene-Cananea Copper Co., was organized under the laws of Minnesota, with the principal offices at Duluth, where articles of incorporation were filed December 22. The new company will have a capital of $50,000,000, divided into 2,500,000 shares of a par value of $20 each, of which 1,500,000 shares will be exchanged for the Greene Consolidated Copper Co. stock and 1,000,000 shares for that of the Cananea Central Copper Co. This combination was brought about by W. C. Greene, J. D. Ryan, and T. F. Cole obtaining controlling interest in the two companies, and forcing the issue; of the new company T. F. Cole will be president, and W. C. Greene vice-president. In addition to Messrs. Ryan and Cole there are associated in this move H. H. Rogers, John W. Gates, and others allied with the Amalgamated Copper Co.'s interests, so that whether or not this latter company may eventually assume control of the Cananea company, certain it is that the financial condition of the new company will be easier, and when improvements are desired by the Greene-Cananea Copper Co., it will probably not be embarrassed by a lack of money as was so frequently the case with the Greene Consolidated, and already there is talk of the new company more than doubling the present capacity of the Greene Consolidated Copper Co. plant. It is furthermore stated that Cole & Ryan are also negotiating for the entire holdings of the Greene Gold-Silver Mining Co., which includes the Consuelo in Chihuahua (just purchased from Corrigan & McKinney for $1,500,000 gold), La Bufa Mining Co., La Dura, and the Yaqui Copper Co. (also recently acquired), together with the smelting plant at Guaymas, Sonora, and the old Federal smelter at El Paso, and concessions for smelters at San Blas, Mazatlan, and Guadalajara. Control of this company, and the building of the smelters for which it holds concessions, taken with the Cananea plants, would give to Ryan & Cole, and their associates, almost complete control of the smelting business of the States of Sonora and Sinaloa and the greater part of the west coast of Mexico.

Most important to the mining interests of Mexico, as well as to all other business interests, is the deal just concluded, and approved by the Federal Congress, whereby the Government obtains control of the Mexican Central railroad. The Government already controls the Mexican National, the International, and the Interoceanic, and these will be merged with the Mexican Central railroad, and a new holding company will be organized with a capital of $225,000,000 gold, of which the Mexican Government is to hold $113,000,000. This combination, with branches in course of construction, comprises 10,000 miles, and includes the principal railroads of the Republic, except the Mexican, from Mexico City to Vera Cruz, and the new roads building, of the Southern Pacific from Guaymas to Guadalajara, and the Mexico, Kansas City & Orient railroad across Chihuahua and Sinaloa to Topolobampo. This merger furthermore means the cutting off of a number of parallel lines, and the consequent building of a number of important branches, particularly needed in the mining districts.

Republic, Washington.

Review of Mining Progress in the Northwest.—Eastern Washington.—Republic District.—New Railroads and Power Plants.— Wolframite.—Palmer Mountain Enterprises.—Chesaw Mines.

Eastern Washington has witnessed an awakening in mining during the past year, and several important developments have been recorded, although Ferry county has been handicapped by the lack of a suitable method for treating the dry ores of Republic, the principal camp. During 1906 the Pearl Con. Co. deepened its main shaft and did some development work on the Lone Pine vein. At Belcher camp, 12 miles north of Republic, the Belcher Mtn. Railway Co. has constructed a narrow-gauge railroad eight miles up Lambert creek, from the Washington & Great Northern Railway to the Belcher mine. The Winnipeg Co. drove about 250 ft. of tunnel to connect with the Belcher Mtn. Railway and is developing the Hawkeye mine from that level, at a depth of about 250 ft. The ores of the Belcher and Winnipeg mines are principally pyrite, containing gold and silver, with signs of copper. The Oversight Co. made a fine showing in 1906. Besides driving on both sides and cross-cutting the Oversight vein in the No. 2 workings, the No. 3 adit has been driven 50 ft., and both are connected by a raise. Since making the connection a large body of ore has been opened up and several shipments have been made to the smelters. The Pin Money vein was encountered last fall, and a shaft, following the pitch of the vein, was sunk 50 ft. Assays from this vein ran high in gold and cobalt, in the form of smaltite. The Copper Key Co. drove an adit 500 ft. long and lateral drifts aggregating about 600 ft.; also a separate adit to strike the orebody 100 ft. below the upper workings. In the lower workings a fine body of quartz ore was encountered that assayed well.

The Bortle Copper-Gold Co. was incorporated a few months ago and has since then done a good deal of exploratory work, sinking shafts, in one of which a fine body of sulphide ore was uncovered. The sale of the Monitor group of claims on Missouri Mtn. has had a stimulating effect in the Lambert creek district. In October the Dominion Copper Co., of Greenwood, B. C., bought the Adelphi group of claims on LaFleur Mtn. for $30,000 and has begun active development work. This

property is situated near the Comstock-LaFleur group, which belongs to the LeRoy Co., and is immediately south of the international boundary line. The same company purchased the Lone Star and Washington claims of the Reservation Co. and is opening up new orebodies in them. The Mineral Hill Co. after shipping 22 carloads of ore from the old workings, drove about 500 ft. of a new adit and during the coming year will extend it 900 ft. farther into the hill, to tap the vein at a depth of over 400 ft. It is advancing at the rate of 100 ft. per month. The company has a complete equipment, including a six-drill Norwalk compressor. Another adit, higher up the hill, is being driven by hand for the development of other veins. The completion of a fine flume, one and one-half miles in length, and a 150-ton smelter, at Keller, has had an encouraging effect in the southern part of Ferry county. Keller is situated in the San Poil district, with many promising properties in the neighborhood.

The big stretch of country east and west of the San Poil river, 50 miles from Republic to Keller, was a vast scene of excitement last summer, when the Spokane & British Columbia and the Washington & Great Northern railway companies began cutting rights of way through the beautiful San Poil valley; but injunctions brought about a cessation of work and a period of depression. Nevertheless, a number of properties have started work; among these are the Umatilla, Gold Cord, Silver Hill, Iconoclast, Humboldt, Byrne, and Manilla, in the San Poil district, the Congress mine on Bridge creek, the Mountain Boy, and others at Park City. Last November the Colville Mining & Smelting Co. was organized to take over the Mountain Boy mine. While Republic is its principal place of business, provision is made for offices at New York and London. During the year F. M. Gates, the former owner and now local manager, drove 200 ft. on the Mountain Boy vein and developed some rich galena and antimonial silver ore. During the year the Meteior Mining Co., at Meteior camp, has extended its adit about 500 ft. and tapped the vein at 660 ft. from the portal at a depth of 325 ft. The vein is four feet wide between walls; a streak on the foot-wall from 1 to 10 in. wide, shows native gold and ruby silver.

One of the most important mining events in the State of Washington was the discovery in the Cascade mountains of wolframite, the most valuable of tungsten minerals. In the fall of 1906 the Tungsten Con. Co. was organized, with Loomis, in Okanogan county, as its principal place of business, and during the following winter and last spring substantial buildings have been erected, trails were opened and the tungsten mine was partially developed. One vein as disclosed in a 60-ft. tunnel, is from 1 to 7 ft. wide; the other is from 10 to 24 in. wide. In a quartz gangue the proportion of wolframite is 10%. The concentrate, as sent to Pennsylvania, will yield 73% tungstic acid. It is probable that a concentrating plant will be built next summer.

The Palmer Mtn. tunnel, already 4,000 ft. long, is to be driven 4,600 ft. further. Work almost ceased for two or three years, but the energetic manager, John Boyd, secured the capital necessary to complete the undertaking. Last year, after building 5,435 ft. of flume, the Palmer Mtn. Power Co. erected a $50,000 electric plant, including a 750-h.p., three-phase, sixty-cycle, 6,600-volt, alternating generator (made by Allis-Chalmers), driven by a turbine, working under a 370-ft. head. An aluminum transmission line was built from the power-house, on Touts Coule creek, two miles to the mine. The line was continued to the town of Loomis, which is now lighted by electricity. During the year the company installed a saw-mill with a capacity to cut 20,000 ft. of lumber per day, driven by electric power. The foundations for a 100-stamp mill were completed. Above the millsite a reservoir of 7,000 gal. capacity was built. The mine was equipped with three Temple electric air-drills. The 12-lb. rails in the adit were replaced by 25-lb. steel rails. A number of new buildings were constructed. At the Copper-World Extension mine, also on Palmer Mtn., a body of ore over 30 ft. wide, having a large excess of iron and assaying well in gold, silver, and copper, was intersected on the No. 2 level in the early part of the year, and since then the main shaft has been sunk to the 300-ft. level, and another cross-cut driven about 200 ft. toward the lode. The Judge Mining Co., an Ohio corporation, bought 23 claims on Palmer Mtn.; they are traversed by numerous veins of quartz, bearing gold, silver, copper, and lead. Some of the ore exposed in the exploratory workings carries native gold and is extremely rich.

The Kimberley Development Co. was organized to take over 14 quartz claims on the eastern slope of Palmer Mtn., of these the most important are the Kimberley and Buzzard claims. On the latter a shaft has been sunk to a depth of 100 ft.; at the bottom the vein is seven feet wide. A tunnel will be extended to intersect the Kimberley vein at a depth of 350 ft. Small shipments of ore will be sent from this property to the smelters as soon as the Victoria, Vancouver & Eastern Railway begins receiving freight at Oroville. Negotiations are on foot with the Similkameen Falls Power Co. for electric power and for the purchase of machinery.

In the vicinity of Palmer Lake, and northward, along the Similkameen river, mining activity has increased steadily during the past three years, and now that railway transportation will be available every effort is being bent towards getting ready to ship ore. Electric power from the Similkameen Falls Power Plant will be available early in 1907, and this will stimulate mining throughout this part of the State.

The Q. S. Co., since tapping the orebody in its main adit last year, has driven the latter 235 ft., cutting through ore of commercial value the entire distance. A few months ago the company stopped hand work, to await the installation of power, and at that time had not reached the back wall of the lode. It abandoned the intention to build a tramway, preferring to drive an adit to cut the ore at a depth of 2,000 ft. on the lode. This new work was started recently. The company is installing a new turbine wheel and electric plant on Sinlahekin creek, about two miles distant from the mine, to develop 1,000 h.p., with which to operate a battery of machine-drills, to be used as soon as the adit enters hard ground. The Q. S. ore carries an excess of iron and sufficient lime to make it self-fluxing. Copper occurs in the form of chalcopyrite. There is talk of establishing a custom smelter in the neighborhood.

Chesaw, a promising camp but retarded by its isolation, has been bidding for favor, and has succeeded in securing some capital. The Grant group of six claims has a fine vein of pyrrhotite, with ore of shipping value in gold and copper. Last fall a shaft went through 16 ft. of copper-gold ore, and in November last a deal was closed by which George A. McLeod, of Grand Forks, B. C., took over the group for a consideration of $40,000. Already a pile of ore, estimated at 300 tons, has been placed on the dump. The near approach of the Victoria, Vancouver & Eastern Railway has invested Chesaw with bristling energy, and a number of other prospects are being developed actively; among them are the Poland China, Mad River, Olentangy, Bimetallic, Jack Pot, Ben Harrison, Interstate, Saranac, Old Germany, Opal, Butcher Boy, and Bluffton. A new hoisting plant has been installed at the Saranac. The shaft and underground workings of the Poland China were re-timbered and a stamp-mill is talked of. The Interstate mine is to be supplied with a power plant.

Mining Summary.

ALASKA.

Development is proceeding rapidly at the copper mines on Latouche Island. One hundred men are at present employed, 58 by the Reynolds-Alaska Development Co. at Boulder Bay and the rest by the other companies at work on the island. The Reynolds-Alaska Co. will ship heavily next year; ore is piling up on the dump, but it cannot be taken to water until a tram is built, which will be done next spring. An electric power plant has been installed, and now four compressors are driving the drilling machinery. Work will be pushed steadily all winter. The group belonging to the Development Co. is known as the Iron Mountain group. An adit a mile long was driven on the lode, and then it was cross-cut, exposing an enormous orebody. Of the other properties on the island, Beason's mine is shipping steadily, although it is worked by hand labor alone, while extensive development work has been done on the Blackbird group, the Singer, and the Buzzard.

CALIFORNIA.

HUMBOLDT COUNTY.

The beaches between Humboldt bay and the mouth of the Klamath river are being prospected, with a view to shipping the richest deposits to the Oriental Reduction Works, now building at Portland, Ore. Besides being a fluxing material the beach sand is rich in gold and platinum. Fred H. Hazard will direct the work of prospecting, in order to locate and explore the richest and most accessible deposits.

INYO COUNTY.

The great Greenwater consolidation, taking in the Greenwater & Death Valley Co., controlled by the Schwab interests, the United Greenwater Copper Co., and the interests controlled by C. Brock and his Philadelphia associates, is based upon the following distribution of stock. Greenwater & Death Valley Co., 68%; United Greenwater, 18%; the Brock syndicate, 14%. The Schwab interests will control the directorate. The site for a smelter has been chosen at Ash Meadows, Nev., about 30 miles northeast of Greenwater. Work is to be begun next week on the construction of the railroad from the mines to the smelter site. There are extensive deposits of lime and iron, and every requisite for smelting except fuel, and this will be brought in from the petroleum fields of California. Recent assays give the average of the ore as 12% copper, $6 gold, and $9 silver per ton.

SAN BENITO COUNTY.

During the past five months 35,000 tons of ore has been taken out of the Florence Mack quicksilver mines in this county, near San Carlos peak. A recent test showed that the shale ore ran 51 lb. per ton, which, at 50c. per lb., makes it worth $25.50, while the iron ore ran 54 lb. per ton, and is worth $27 per ton. Three hundred feet of adits have opened up good prospects of both iron and shale ore. There is now enough material uncovered to run a 10-ton furnace regularly, but the weather and the condition of the roads are such that it would be impracticable to build a furnace at the present time, the brick having to be burned on the ground; therefore, the owners have decided to keep on blocking out ore and driving adits until next summer, when it will be possible to put in an adequate furnace and keep it going continuously.

SAN BERNARDINO COUNTY.

At the Kelso mine, situated on the Salt Lake route, 250 miles from Los Angeles, three well-defined lodes have been uncovered, extending for a length of 2,000 ft. and 300 ft. apart. Surface indications show the veins have highly mineralized outcrops containing gold, silver, copper, and lead. A shaft has been sunk 80 ft. A steam-hoist is about to be installed, and work pushed in order to reach the 500-ft. level, where it is believed the three lodes effect a junction.

SHASTA COUNTY.

Foundations for the bridge across the Sacramento river have been completed on the new railroad location on the Pitt river. Grading will be commenced shortly, and construction work carried on vigorously. This railroad will pass through the experimental iron smelting works at Heroult, and follow the Pitt river to the Bully Hill copper district.——Construction has also been commenced on the railroad that is being built from the Quartz Hill mines to the Southern Pacific railroad at Central Spur. This will afford an outlet for the silicious ores, which are in great demand for fluxing purposes at the United States smelter at Kennet.

TUOLUMNE COUNTY.

Rich strikes have been made in several of the mines on the east belt during the past few days. At the Garfield mine, situated less than two miles northeast of Tuolumne, the vein was struck at a point where it is four feet wide and runs hundreds of dollars per ton, outside the rich streak, which is a mass of wire gold. The strike is said to be the best made in this district in many years. A report is in circulation here today that the mine has been purchased outright by a Colorado man for a large sum, but the rumor could not be verified. The Confidence is another mine in which a good strike has just been made. At the bottom of the new three-compartment shaft, being sunk 1,000 ft. north of the old one, the vein, four feet wide, averages $200 per ton. A streak several inches wide will run a great deal higher.——The shaft of the Providence mine, now 1,330 ft. deep, will be sunk another 100 ft.——W. A. Nevills is personally directing operations at the App mine, near Quartz, and will shortly have close to 100 men employed. Forty stamps are pounding on ore, and within a few days the entire mill, 60 stamps, will be in operation.——Work has been temporarily discontinued at the Uncle Sam mine, at Arastraville, owing to the necessity of a larger hoist, which, it is said, will soon be installed and operations resumed. Some good ore was recently uncovered in this mine.——The adit being driven at the gravel property of the Springfield Tunnel & Development Co., at Springfield, is now 250 ft. long, and the prospects are said to be exceedingly good. A Sparks Kroh mill having a capacity of 80 tons per 24 hours has been purchased and will be installed on this property.——The Atlas mine, near Tuttletown, is being unwatered for inspection by San Francisco capitalists.——The Yankee Hill Gold Mining Co. has begun hydraulic mining on its property near Columbia.

Tuolumne, Dec. 31.

NEVADA.

ESMERALDA COUNTY.

In spite of dispatches from Goldfield that the miners strike is all but settled, George Wingfield, now in San Francisco, insists that he has not received any word that might indicate that the strike is any nearer settlement than it was a week ago. He contends that while operators may be on the verge of a friendly disposition of the affair, so far as the Goldfield Consolidated people are concerned there is no new development. He adds that the leases on the merger properties expire in a few days, and that the Consolidated management is prepared to shut down all the mines, to work them on their own account later on. This attitude in regard to the strike situation has caused many mining men to believe that the market in southern Nevada securities is being beared, and that when the time is ripe the trouble with the miners will disappear.

According to official figures the Mohawk mine produced during the month of November $1,066,500 in gold. This does not include ore in transit or in the hands of the smelters for which settlement has not been effected. The output of the Red Top was $60,000, the Jumbo $30,000, and Combination $80,000. The Hayes-Monette is stated upon the authority of G. H. Hayes to have $1,080,000 stored in the vaults of the John S. Cook bank. Fifty per cent of this value, or a total of $540,000, was extracted in November. The Frances-Mohawk lease also has $30,000 worth of ore stacked at the State Bank & Trust Co., of which 50% was mined in November, according to the estimate of S. Oliver, the manager. This output is not included as part of the Mohawk production for the month.

LINCOLN COUNTY.

Grading has been started to clear the ground for the addition of 20 stamps to the Quartette mill. The old mill on the Colorado river will be torn down and set up alongside the present 20-stamp mill, making a total of 40 stamps, and

enabling the company to crush 140 tons of ore daily. The force of men will be doubled, and a large number of new buildings erected.——The Big Tiger Co. will sink its shaft from 112 to 212 ft. It is the intention of the company to sink to water-level and test the formation before driving and cross-cutting. The mine is situated at the head of Tiger Wash on the east slope of the Crescent range, 100 yards from the road between Nipton and Searchlight. In the New Year's Gift the lode has been picked up in a winze to the east of the fault, and the ore is as good as ever. High-grade shipping ore has been cut and is now being sacked. It assays $35 in gold, 30% lead, and 3% copper.

(Special Correspondence).—Fred Carlsen returned from Philadelphia last week accompanied by B. B. Lathbury, a mechanical engineer, and Dr. Haerer, representing a syndicate of Philadelphia capitalists, who have purchased the control of the Searchlight Consolidated Co. They advised the sinking of a new shaft, on the Oregon claim, at a point where Mr. Carlsen had struck some rich ore on the surface, and two shifts are now sinking a double-compartment shaft which the company intends to send down to the water-level as fast as men and money can do it. The syndicate has ordered a 25-h.p. hoist, and has commenced the erection of the necessary buildings to accommodate the men. The surface showing on the Searchlight Consolidated ground is above the average in this district, and the vein in the 80-ft. shaft on the Oregon shows free gold from the surface to the bottom.——John C. Quinn, an engineer from New York, spent the past week looking over the X-Ray property, which adjoins the Pompeli and was recently purchased by New York parties.——The Quartette Co. is placing foundations for the erection of 20 more stamps, which will double their present capacity.——J. F. Wisner, of New York, has completed the purchase of the Philadelphia group, located on Nob Hill 14 miles north of Searchlight, on the road to El Dorado cañon, and has given a contract to A. J. Peak to sink the main shaft 100 ft. further. Mr. Peak, who has worked on this property for some years, states that there are five distinct veins on the ground owned by the company, one of them six feet wide and assays $10 per ton.——E. P. Tull has made an important strike on the Wash group at Camp Thurman. A lode of quartz three feet wide containing free gold, galena, and copper sulphides has been uncovered, the continuity of the vein is established. Mr. Tull has also found gold in paying quantities on the Red Bird claim.——The Colorado Co. has placed the foundations for the new engines and electrical equipment, which consists of a 25-h.p. hoist and a 60-h.p. engine and large generator. The electrical plant will be used for operating the pumps.

Searchlight, Dec. 24.

NYE COUNTY.

The mines of Tonopah have paid $2,200,000 in dividends since Jan. 1, 1905. Of this sum Tonopah Mining paid $1,200,000, Tonopah Belmont paid $800,000, and Midway $200,000. Ten mines shipped ore in some quantity. The largest shipper, the Tonopah Mining Co., sent out 67,000 tons; Tonopah Extension, 27,500 tons; Tonopah Belmont, 15,300 tons; Montana Tonopah, 4,650 tons; Midway, 4,000 tons, and West End, 1,000 tons. Macnamara, North Star, and Jim Butler shipped 1,600 tons altogether, and miscellaneous shipments of 275 tons more brought the total shipments up to 121,375 tons for the twelve months. The work of the year enabled the management of the Tonopah Mining Co. to prove the Mizpah lode. Development of the Valley View vein is proceeding at 600 ft. depth. Both the Mizpah and Valley View lodes are reported to be improving with depth. The Tonopah Mining Co. has completed a new mill of 100 stamps at Millers, 13 miles from Tonopah. The Midway mill has also been purchased. The output of the two mills will enable the company to pay $5,000,000 in dividends during 1907. In the last twelve months the Belmont has widened the shaft to three compartments, and has opened the mine from the 500 to the 1,100-ft. level. The Montana Tonopah is erecting a 40-stamp mill that will be completed in the spring. Dividends were passed because of the cost of mill construction and the equipment of the mine. The Tonopah Extension Co. has found the lode 1,200 ft. west of the shaft, and has developed a body of ore 45 ft. wide. A 100-stamp mill will be erected this year. The West End, the Macnamara, and Jim Butler mines entered the producing class in 1906. When the mills now in course of construction are completed the output of the Tonopah district will be enormously increased.

Both the Pike's Peak and Little Pittsburg groups of claims in the Wonder district have changed hands, L. B. Hahn, of Goldfield, and associates having purchased them. The price paid for the Pike's Peak was $60,000, and for the Little Pittsburg $25,000. The former group adjoins the Queens on the north, and consists of eight acres, the lodes and formation being similar to those found on the Queens. The surface ore assays from $50 to $300. The Little Pittsburg group consists of 80 acres, adjoining the Jack Pot and Queens on the east.

WASHOE COUNTY.

An important deal has been closed by which F. A. Morath, of Colorado Springs, has acquired large interests in the Rocky Hill Co., operating 17 miles south of Reno. Exploitation on a large scale has been determined on, the capacity of the mill will be doubled and the force now at work greatly increased. More than 5,000 ft. of underground workings have been advanced and large orebodies disclosed carrying average values of from $10 to $20 per ton, easily treated at the stamp-mill and cyanide plant now operated by the company. This ore can be mined and milled at a cost not exceeding $2 per ton, and there is sufficient ore to run the plant at double its present capacity for several years. During the time the deal was being negotiated a discovery was made at the bottom of the main working shaft, in cross-cutting the vein, the lode widening out to six feet between well-defined walls, and giving high assays.——The Reno-Mispah mine situated 2¼ miles north of Reno, has been aggressively developed during the last six months, and there are now disclosed several strong veins carrying milling ore. Average values of $5.50 per ton were encountered in the upper adit, the ore concentrating about six into one. In the lower adit several stringers have been cross-cut carrying from $50 to $100 per ton in gold. In the face of the drift three feet of good milling ore has been cut, assaying $20, and carrying sulphides in large quantities. The property is equipped with a gasoline engine and air-compressor, a blacksmith shop, and one of the most completely equipped assay-laboratories to be found in the State.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—A number of changes have taken place since my last letter. First, I have to report the sale of the Granite Reef group of mines to R. G. Galespie of Pittsburg, Pa., for $20,000 of which $1,000 was paid down and the balance due on March 14, 1907. This group of claims is situated about two miles southeast from Custer city, and consists of ten full claims, three fractions, a mill-site and water-right. The property is developed by shallow shafts on all the claims and one adit that penetrates the mountain to a depth of 300 ft., cutting a vein of good ore 12 ft. wide. The vein is vertical between walls of quartzite and slate. Seven men are now engaged in sinking from the adit level. Dan. McGonigal, of Custer, is superintendent. The Granite Reef was formerly owned by C. W. Robbins, James Demereau, and Judge A. T. Feay, of Custer.—The Lillian Belle group of claims was also sold about the middle of December and was purchased by the same party that bought the Granite Reef, for the sum of $7,500. This group consists of seven claims and is developed mainly by an adit 130 ft. deep, which cuts a vein 25 ft. wide. This group joins the Granite Reef on the north and this purchase consolidates the two properties. The former owners were Chas. Harbach, Chas. Smith, John Malon, W. Palmer, all of Custer. D. McGonigal is superintendent.——The third sale to be announced during the months of November and December was that of the New York & Custer, formerly known as the Newark group, consisting of 21 quartz claims, and one 80-acre placer claim. The property is situated at the mouth of Crow creek, about four miles due west from Custer. The company now employs 17 men, who are sinking a shaft on the Newark, and will employ more good miners as fast as they can be got. Chas. Waite is general manager, and Dan. Baker is the superintendent of the mine.

Custer, Dec. 24.

Personal.

W. C. HAND is inspecting mines in Siberia.

S. J. DENE has returned to London from the Sudan.

C. A. BOHN, of Mexico City, is visiting friends at St. Louis.

D'ARCY WEATHERBE is at London, on his way to South America.

FRANK H. PROBERT is examining mines in Inyo county, California.

C. M. FULLER has returned from Louisville, Kentucky, to Denver.

BEN. S. REVETT leaves San Francisco for New York on January 7.

ARTHUR L. WALKER will return to San Francisco about January 21.

F. LYNWOOD GARRISON has returned to Philadelphia from Mexico.

C. EVERARD ARNOLD has left Ely, Nevada, and is now at Salt Lake.

FOSTER HEWETT, of Pittsburg, passed through San Francisco on his way to Arizona.

BENJ. B. LAWRENCE has been appointed Western manager for the Lanyon Zinc Company.

JESSE C. SCOBEY has been at Denver for a few days, on a visit from Washington Camp, Arizona.

W. W. BRADLEY has been engaged as engineer for the Ventanas Con. Co., in Durango, Mexico.

W. W. WISHON, who now lives at Los Angeles, has just recovered from an attack of typhoid fever.

WALTER H. WEED is leaving New York to examine mines near Sombrerete, in Zacatecas, Mexico.

J. R. FINLAY has moved from Colorado Springs to New York, where he has an office at 71 Broadway.

WILLIAM W. MEIN, manager of the Robinson mine, at Johannesburg, is visiting his home at Oakland.

JOHN HAYS HAMMOND and A. C. BEATTY are expected in San Francisco at the end of the current month.

A. W. WARWICK has returned to Denver after an absence of nine months in Mexico. He will return thither shortly.

ARTHUR W. STEVENS, superintendent for the Boise King Placers Co., in Elmore county, Idaho, is visiting relatives at Chicago.

LEWIS C. PARKER has just returned from Montana with his family to Los Angeles and left for Jerome, Ariz., on December 31.

THEO. L. LAMMERS, of Spokane, Wash., has been appointed general manager for the Panhandle Smelting Co., Ltd., of Ponderay, Idaho.

A. P. ROGERS is on his way from Los Angeles to New York, whence he goes to Colombia, to examine gravel deposits. He will return in April.

R. B. STANFORD, having regained his health, has resumed his position as manager for the Siempre Viva Mining Co., at Bluefields, Nicaragua.

ROBERT H. RICHARDS is at work writing an appendix to his book on 'Ore Dressing,' to bring it up to date. He will be glad to receive information concerning new improvements in machines and mill-plants.

ROSCOE H. CHANNING JR., who has resigned as general manager for the Utah Consolidated Mining Co., has been appointed president of, and general manager for, the Cerro de Pasco Mining and Railroad companies.

L. D. RICKETTS, who has been consulting engineer to the Greene Consolidated Copper Co. for the past three years (in addition to his regular work with Phelps, Dodge & Co.), has been appointed general manager for the new Greene-Cananea Company.

S. J. GORMLY, formerly superintendent of the blast-furnace department at Anaconda and later superintendent for the Bingham Con. Co., at West Jordan, Utah, recently visited Anaconda and Butte, where he employed a number of furnace-men to assist him in his new work as metallurgist for the Cerro de Pasco Mining Co. at Lima, Peru. Mr. Gormly left for Lima on January 2.

E. G. SPILSBURY broke his left leg and left arm by accident in stepping off the porch of a mine boarding house, on December 20; he was taken to a hospital at Nogales, Arizona, where he is receiving the best of care. Both breaks are simple and clean, and there is no danger of any sort. He is resting comfortably and the doctor expects to have him up and out of doors in a few days. His son, Persifor, came from Cananea to be with him.

JAMES B. RISQUE, recently underground superintendent at the Calumet & Hecla mines, has resigned his position there to take that of general manager for the Utah Consolidated Mining Co., with main office at Salt Lake City, Utah. The property includes the Highland Boy mines, at Bingham, and the Highland Boy smelting works, at Murray. Mr. Risque goes to his new post as an all-round mining man, familiar not only with mining, but also with the concentration, the milling, and the smelting of ores, and with the details of business management.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, January 3.

Argonaut	$4.15	Furnace Creek	$5.50
Con. Virginia	1.25	Savage	1.15
Mexican	0.93	Sierra Nevada	0.85
Ophir	3.30	Yellow Jacket	1.55
Belmont	6.05	Montana	4.00
Jim Butler	1.35	Mohawk	14.00
Jumbo	3.40	Red Top	3.20
Jumping Jack	0.45	Sandstorm	0.69
Manhattan Con	1.03	Silver Pick	1.30
Midway	2.35	Tonopah Ex	6.75

Quicksilver per flask of 75 lb	$38.50
Lead, in 50-ton lots	6 cents per lb.
Antimony, refined metal, in ton lots	27 " " "

ANGLO-AMERICAN SHARES.

Cabled from London.

	December 27.	January 3.
	£ s. d.	£ s. d.
Camp Bird	1 8 6	1 8 6
El Oro	1 5 0	1 6 9
Esperanza	2 15 0	2 14 6
Dolores	1 6 3	1 7 6
Oroville Dredging	1 0 9	1 0 6
Stratton's Independence	0 3 3	0 3 3
Tomboy	1 11 9	1 12 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average prices for month ending December 31.	Average prices for week ending January 3.
Copper—Lake (cents per lb)	23.340	23.85 @24.10
" Electrolytic "	22.885	23.30 @23.80
" Casting "	22.562	23 @23¼
Lead "	5.90	6
Spelter "	6.584	6.71
Silver (cents per oz.)	69.05	69⅞

CURB QUOTATIONS—NEW YORK.

	Closing Prices Dec. 27.	Jan. 3.
Bingham Central	1⅜	2
Boston Copper	31	32⅝
Calumet & Arizona	170	177
Cumberland Ely	12¼	12⅜
Dolores	7¾	7¾
El Rayo	6½	6⅞
Guanajuato Con	4⅞	4⅜
Giroux Con	9½	9⅞
Greene Con	33	32⅛
Nevada Con	18⅛	18
Nipissing	12⅛	13½
Tennessee Copper	48¼	48¾
Tonopah Ex	6¼	5⅝
Tonopah-Belmont	6	5½
Tonopah	20⅜	19⅞
United Copper	70⅞	73¾
Utah Copper	30¾	33¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

REGULAR stage service, twice a week, will be maintained this winter between Valdez and Fairbanks. The new winter trail saves fifty miles over the old one.

A STATEMENT of the value of the various industries in Alaska shows that the fisheries lead all others, the production from 1878 to 1905 aggregating $96,000,000.

QUICKSILVER is produced in Utah, to the extent of 1,276 flasks per annum. It comes from Mercur, where cinnabar occurs in association with gold deposits. Texas and California are the only other States producing quicksilver.

ALTHOUGH 1 lb. of good coal is capable of evaporating 15 lb. of water, in practice this is never attained, the highest under careful test being 12.9 lb.; in the every-day work of an ordinary mine plant from 5 to 7 lb. would be the average.

IN sampling the bottom of a level, great care must be taken to prevent wrong results due to infiltration of fine rich stuff dropped by the cars or from the roof. Similarly, by washing the ore a misleading result may be obtained because it removes the fine stuff that belongs to the sample.

COMBUSTION is neither more nor less than oxidation, the chemical union of other elements with oxygen. This union takes place at varying rates; the extreme on the one hand being the explosion in the gas, oil, petrol motor, or gun; while as instancing tardy action we have the rusting of iron and the drying of paint.

QUARTZ ORE containing gold is being broken at 4,145 ft. in the Victoria Quartz mine at Bendigo, Australia, but the returns are not high, 112 tons yielding 68 oz. 12 dwt., that is, a little over 12 dwt. per ton. The ore of the saddle reef is 8 ft. wide and it will pay to stope, but a great deal of expensive exploratory work must be paid for as well, out of any profits now secured.

AFTER the rivers freeze all mail to the interior of Alaska and Nome and St. Michael goes by way of Valdez. From here it is taken by two routes inland, the one reaching Nome and St. Michael via Fairbanks and the other via Eagle and Tanana. The mail via Fairbanks leaves twice a week, Mondays and Thursdays. Via the Eagle route the mail leaves but once a week from Valdez.

A SECTIONALIZED MACHINE, when erected where it was made, may be as efficient as any other form; but it is not so at the end of a long and difficult journey, when rust and rough usage have destroyed the accurately machined surfaces, and parts and connections have possibly been lost on the way. In such cases considerable skill is necessary to construct even a workable machine from the damaged remnants.

THE owner of the loaned specimens may bring suit for their recovery or for their value. If the borrower disposes of them without the consent of the lender, he may be chargeable with larceny or embezzlement. If he uses them as the basis of selling property from which they did not come, he might be liable for obtaining money under false pretenses. The facts stated in the inquiry suggest several methods by which the borrower might succeed in breaking into jail. It might be well for the lender to wait until the borrower exhausts his efforts in this direction.

AS REGARDS the running of machinery, there is little doubt that greater economic efficiency in the production and use of power would be obtained if the results were tabulated and made more apparent, and if the cost of a hundred horse-power spent in raising ore or water were known with the same accuracy as the gold extraction. The data required are easily obtainable, the calculations by no means involved; yet on many mines power is produced regardless of cost, efficiency untested and unknown, the indicator never used.

THE pendency of litigation over laborers' liens does not excuse the performance of the annual work on a mining claim, either by the owner or the lien-holder. Unless one or the other does the work, the claim would be subject to re-location. In the event of a re-location by a stranger, the rights of both lien-holder and original locator would become extinct. It has been held by the Land Department that where litigation is pending relating to mining claims arising out of patent proceedings and adverse claims, annual work is not required to be done. The correctness of this rule is doubtful. In all cases a bona fide attempt should be made to do the work. In no event, however, could this departmental ruling be extended to cases of litigation disconnected with the patent proceeding.

To apportion among a large number of contiguous claims the expense of erecting a stamp-mill on one of them for reduction of ores in an attempt to satisfy the law as to annual work on all the claims would be a dangerous experiment. The object of the law requiring annual work to be done contemplates that such work should develop actually or tend to develop the mineral resources of the claim or facilitate the extraction of ore. A stamp-mill reduces the ore but does not facilitate its extraction or in any sense tend to the development of the claims, particularly those other than the one on which it is erected. If properties are intrinsically or prospectively valuable, the safest course is to protect them by doing the work in an unequivocal way. The amount of money expended over one 'jumped' claim would probably pay for several years' work on all the claims.

THE one who first completes the acts of location required by law would be entitled to the claim. In California, in the absence of a local district rule, recording is not necessary. The location would be complete by marking the boundaries. If *A* marks his boundaries first, and a record is required by local rules, he would have a reasonable time to file his notice for record after marking his boundaries. *B* could not defeat the rights accruing to *A* by making a later location and by a race of diligence place his notice on record first, provided *A*, of course, recorded his notice within a reasonable time. "Reasonable time" is determined by the situation of the mine with reference to the Recorder's office, and the ordinary methods of communication between the two points. Midnight locations are looked upon with disfavor. As between two strangers attempting to relocate the same claim as against the original locator, probably the midnight locator would take precedence over the one made later in the morning. But an original locator resuming work January 1 at the ordinary morning hour of commencing labor would hold the claim against a midnight or early morning locator.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Goldfield Mines.

The Editor:

Sir—We who live at Goldfield think that a grave mistake is made in your editorial of December 15 classing the Goldfield Consolidated Mines promotion with the "affair of Dr. Lyman" and an injustice is done to the Goldfield Consolidated Mines Co. as well as incidentally to the district in general.

One is an instance of the consolidation of rich mines effected by reputable men, the other is an example of the nefarious work of a fakir who used a sham mining deal as an instrument in the perpetration of fraud.

It is the opinion of engineers familiar with the ground that 50 million dollars fairly represents the value proved and immediately prospective, of this property; but granted their estimate is a little high, is there warrant in classing these rich mines and their consolidation with the "affair of Dr. Lyman?"

Then, to quote your editorial, "the purchase of the Combination mine for $4,000,000 does not represent sound judgment—four millions for a mine that has paid only $786,000 in the last 25 months and that is only 300 feet deep looks like a gambler's throw." How is it that in your analysis of this purchase the dominant factor of available ore reserves was overlooked? Again, "When Winslow and Hubbard bought the prospect for $75,000 they exhibited good judgment and they have since profited by the speculative exuberance of their neighbors." Now, how much had the Combination prospect paid when Winslow and Hubbard made their exemplary purchase? Nil. How deep was the shaft? Ten feet. What was the estimated tonnage of available ore? Uncertain; none to speak of.

And yet in your opinion, *ex post facto*, Winslow and Hubbard exhibited "good judgment" in their purchase. Was not this purchase by Winslow and Hubbard much more "like a gambler's throw" and an example of "speculative exuberance" than the recent purchase for four millions of the Combination mine with its extensive development and vast resources of available ore?

In another article in an adjoining column you made the editorial comment that "it is a remarkable fact worthy of note that after 28 years working 35 per cent of the Homestake ore still comes from the surface;" yet the Homestake is a mine of great worth; so, in the dearth of details as to the Combination mine what has the fact that it is "only 300 feet deep to do with the matter? And in the absence of information as to whether the Combination mine was worked for 25 months for a maximum output or for the segregation of a maximum ore reserve, what has the fact that it has only paid $786,000 to do with an estimate of the mine's value?

It is most regrettable, particularly in the present onslaught on Nevada mining interests, that a mine that has produced $50,000 gold per day for 106 consecutive days, and that is prepared to materially increase this rate of production, should be designated an "excuse for one of the greatest gambling affairs on record".

A careful reading of the clear and business-like 'Announcement' issued by the company shows:

First, no treasury shares are to be sold.

Second, the shares issued are confined to the number necessary for acquiring control of the properties which go to make up the consolidation.

Third, a great preponderance of the total capital stock remains in the treasury and inures solely to the benefit of the stockholders.

To a man familiar with the ground, in touch with events and acquainted with the high character and ability of the directors, the Goldfield Consolidated Mines Co. appears to be a clean business enterprise of great merit; moreover, it is of heroic stature and the mine, from its output of gold, is destined to be one of the greatest in history.

FREDERICK S. HARRIS.

Goldfield, December 28.

[No objection can be made to so fair a protest; Mr. Harris evidently writes in good faith and we are glad to publish his letter. Naturally, we do not accept all of his corrections. The affair of Dr. Lyman was not classified with the Goldfield Consolidated promotion; they happened to be contemporaneous events. As to the comparative exercise of judgment in the purchase of the Combination prospect for $75,000 and the purchase of the Combination mine for $4,000,000, there is this to be said, that the latter sum is fifty times greater than the former; furthermore, the first has been justified by the logic of events, while the latter remains yet to be proved. All prospects are hazardous, they are matters of judgment rather than estimate, and criticism of the sums paid for them is impracticable, because the purchase is usually based more on instinct (itself the product of experience) than on measurable ore reserves or accurately ascertainable facts. But when it comes to buying mines for big sums of money, it is customary nowadays to estimate ore reserves carefully and to leave as little as possible to mere luck; one is entitled to a mere opinion of a prospect, but one must have accurate estimates, founded on laborious sampling and detailed assay-plans, to pass upon the value of a mine. The 'announcement' of the Goldfield Consolidation is not up to date because it lacks the data essential to a proper prospectus; it is not stated even on whose examination and report the $30,000,000 of ore is based; no estimate is of any value save that of a capable engineer who has gone into the matter fully; the name of such an engineer appears on the prospectus, but not in such a way as to give his personal authority to the statements made.

To compare the Homestake, a low-grade ore deposit several hundred feet thick, with the Combination or the Goldfield Consolidated, containing comparatively small veins of extremely high-grade ore, is to obscure the point. That a mine is producing $50,000 per day is a fact falling far short of justifying a valuation of $50,000,000; the $50,000 is not profit, if two-thirds of it be profit, this performance must go on for 1,600 working days, or five years, to pay back the capital, and for eight or ten years to return the capital and pay a proper interest on it. It is a great mine, but in the exuberance of their speculative activities the promoters have overcapitalized it. This is our friendly opinion, without bias, for naturally we want to see Goldfield and all the other new camps as rich and productive as possible. Our motive in offering criticism is on the surface, it is simply to prevent losses of money that in the long run must seriously injure legitimate mining.—Editor.]

A Curious Occurrence.

The Editor:

Sir—On November 1, 1906, during the first cold snap of winter in southwestern Siberia, somewhat after noon, and after snow had fallen, I happened to look toward the zenith and was surprised to find two suns above me in place of the usual one. The second was inferior to the first in brightness and a few degrees to the west. It had rather the appearance of a cross with a very luminous

centre, altogether too bright for the eyes to more than glance at, and reminded me of the effect produced by looking at the full moon through a wire screen. Around the sun proper was a wide and luminous ring of light, while toward the west was a short segment of rainbow showing faintly the prismatic colors. There was no snow falling at the time, although it is probable that snow was passing overhead in the upper air currents. I have lived in cold countries before, but never saw this phenomenon. Are there not such phenomena as 'sundogs' and is this an example? I cannot say this pertains much to mining, but your valuable paper is also allied with science, under which this observation falls.

H. E. WEST.

Spassky, Siberia, November 20.

[This is what is known as a 'mock sun'; it is a kind of halo, due to condensation of moisture and formation of ice crystals in the upper layers of air.—Editor.]

Tube-Mill Lining.

The Editor:

SIR—I was very much interested in Mr. Drucker's experiences with tube-mill linings in Korea, as described in your issue of November 17, and thought a few notes from our experience of the past two years at Bodie, California, might add a point or two.

The tailing-flow from the stamp-mill of the Standard Con. Mining Co., passes directly through classifiers. The tube-mill is used to re-grind the underflow, or coarser material from the classifiers; with which is also fed dry tailing from the old slum ponds. The tube-mill used is an Allis-Chalmers pattern, about 22 ft. long by 5 ft. diameter, as illustrated by the accompanying photograph.

The first lining used in the mill consisted of special steel plates about 10 by 12 in. area by one inch thick, with a base made so that the entire lining was intended to be interlocking. These plates had a life of four or five months, but as is often the case with castings subjected to grinding action, some of them would wear unevenly and occasionally one would drop out of place. This necessitated stopping the mill and replacing the loosened plates.

The next lining used was in the form of pine blocks, cut from 4 by 6 in. sawed timber into 6-in. lengths, trimmed slightly wedge-shaped (to allow for curvature of shell), and set on end. To place a new set of these pine-block liners, including removal of old blocks, and shoveling out and in of the load of pebbles, required usually about 36 hours. (The tube has only the one man-hole, the cover of which is shown in the photograph.) A set of these liners lasted from ten days to two weeks. Aside from its short life, this lining had the disadvantage (by reason of the vegetable oils contained) of making a soapy mixture with the alkalies present in the cyanide solution (crushing being done in solution). This saponification caused excessive foaming in the batteries and on the plates of the stamp-mill (for after going through the zinc-boxes the solution was re-standardized and returned to the battery storage vat), and also in the tube-mill, launders, and vats in the cyanide plant. After a few sets of these pine liners had been tried, a similar set was made out of blocks of mountain mahogany, a dense, hard wood from the Sierra Nevada mountains. This gave a few days longer life, and the saponification was decreased.

Next we tried a quartz lining similar to the one Mr. Drucker describes, except that there were no steel rails on the inside of the shell. The quartz consisted of selected pieces of chalcedonic vein-stuff, very hard and close-grained, from the mine. This lining was carefully put in with portland cement, and then allowed to set for about ten days. In less than half an hour after starting up, the pounding of the pebbles caused the lining to break. This 'hasty finish' was, at the time, imputed to the quality of the cement used and to the fact that it was not allowed longer to set. Mr. Drucker's experience, however, shows that it was not altogether due to such causes. We next tried silex lining; but while this did not take quite as long to place and for its cement to set, as did the quartz lining, it did not give as long a life as was expected. The silex lining, also, acted similarly to the first steel-plate liners used, giving uneven wear, with occasional dropping out of blocks.

Then, it was decided to try wrought-iron bars, 8 in. wide by 1 in. thick, a quantity of which were on hand, having been used as connecting straps or plates at the joints in the old Cornish pump in the Lent shaft of the same company. It was first suggested to bend into circles to fit the inner surface of the tube-mill shell; but, as we had no machine-shop rolls, and the bending would have to be done by hand in the blacksmith-shop, that idea was dropped. The bars were cut in 15 and 7-ft. lengths (15 ft. being the longest that could be handled through the man-hole of the tube-mill). These were put in, alternating (so as to break joint), lengthwise of the

Tube-mill at Bodie.

tube, and bolted with counter-sunk bolts that passed through the shell. The nuts and washers on these bolts are shown by the photograph. The bolt-holes in each strap are 'staggered'; and, it was not necessary to space them closely, because of the length of the pieces. The liners were all drilled to the same measurements; and, in putting in the first set, holes were drilled in the tube-mill shell to correspond, subsequent sets not requiring further drilling of the shell.

As stated above, these straps or bars were of wrought iron. They give a life of between three and four months, and are easy to change—the entire operation of shoveling the load of pebbles, unbolting old, and bolting new liners, requiring only between 20 and 21 hours. The width of the straps, 8 in., does not allow them to fit closely to the curve of the shell, but that is an advantage, as it has a tendency to turn the pebbles over on themselves, instead of sliding, which action wears out the liners rapidly. This mill has been grinding from 50 to 75 tons daily. The portion of the stamp-mill product requiring re-grinding is principally a tough, hard, chalcedonic quartz.

WALTER W. BRADLEY.

Berkeley, December 10.

A NOVELTY in tin-ore dressing in Cornwall is the use of the Ferraris ball-mill for crushing the ore. A single mill crushes 2,240 lb. ore per hour to pass a 30-mesh screen, requiring seven horsepower.

Progress in Cyanidation During 1906.

Written for the MINING AND SCIENTIFIC PRESS
By ALFRED JAMES.

The making of slime and the treatment of it may be taken as the main directions of improvement in cyanidation during the year. The use of tube-mills has progressed by leaps and bounds, and is now rapidly becoming well-nigh universal, but with the adoption of these machines the question of slime treatment has forced itself into still greater prominence, and as stated by me last year, some of our keenest metallurgists have been attacking this problem, and it is now possible to state that their endeavors have met with a considerable measure of success.

As will be indicated later, progress has also been made in the treatment of difficult ores—including silver-gold ores, antimony-gold concentrate, and cupriferous tailing—and in crushing, roasting, and conveying we are ahead of last year's practice.

It is interesting to note how the treatment of gold ores has overlapped the metallurgy of the other metals. Fine sliming and prolonged cyanide treatment constitute a method that, in many cases, is ousting chloridizing roasting and the old patio process for the treatment of silver ores. Copper ore in Chile is now being leached in a cyanide plant—without cyanide—and the Merton roaster, so successfully introduced in Australia for gold ores, has taken a hold on the zinc industry for the roasting of zinc blende, and for the treatment of the zinc-lead-silver concentrate of Broken Hill. Indeed, one cannot fail to be struck by the way in which names well known in gold-milling, such as Argall, Marriner, and Simpson, have been attracted to the problems presented by zinc-lead ores.

It is difficult to put a finger on any one part of the world as having made the most striking progress of the year. Western Australia still has the pre-eminence. Inventions that may have originated in other countries appear to be more quickly put to definite practical service there than elsewhere, and just as Western Australia has taken the lead in fine sliming and in circulating cyanide solutions through the mill, so now it seems to be the pioneer in slime treatment. Probably the emulation arising from the up-to-date methods of the leading firm of mining engineers on the one hand, and independent managers on the other hand, has tended to place Western Australia in the forefront in the matter of new methods, high extractions, and low costs. Certainly such men as Hamilton, Moss, Nicholson, and Klug, and the gentlemen associated with Bewick, Moreing & Co., have cause for congratulation on the results they have achieved and are achieving, and the adoption of their methods in other regions shows that the industry, not locally but generally, is under an obligation to them, as well as to the alert and progressive West Australian Chamber of Mines, which has published an excellent series of articles by Mr. Robert Allen on ore treatment as carried out at the various local installations.

American practice has chiefly busied itself with tube-mills and slime treatment. Argall, Bosqui, Butters, and Merrill have all been contributing to our advancement by getting out improved methods. In Africa the publication of the results obtained by the brothers Denny at the Meyer & Charlton and New Goch mills has caused much interest, for extraction and output have been increased and cost lowered—mainly by the use of tube-mills. Record gold outputs are again being produced from the Transvaal, which has more than recovered the set-back occasioned by the war.

Crushing.—The tendency to stage-crushing is in still greater evidence. Coarse breakers, fine crushers, heavy stamps, pans, tube-mills, are not an uncommon sequence. With reference to breaking of ore, however, it has not yet been proved that reduction to finer than 2½-in. cube is advantageous for the stamps. Experiments seem to indicate that finer crushing is more expensive than the gain arising from any increase in stamp duty will warrant.

As for crushers, the Gates type still holds the field for big work, but the Bigelow breaker, of the Blake type but with the pitman working in compression and having its weight assisting the crushing stroke, appears to be replacing the other kinds at Kalgoorlie, and to show a lower running cost than either the gyratory or the older reciprocating patterns.

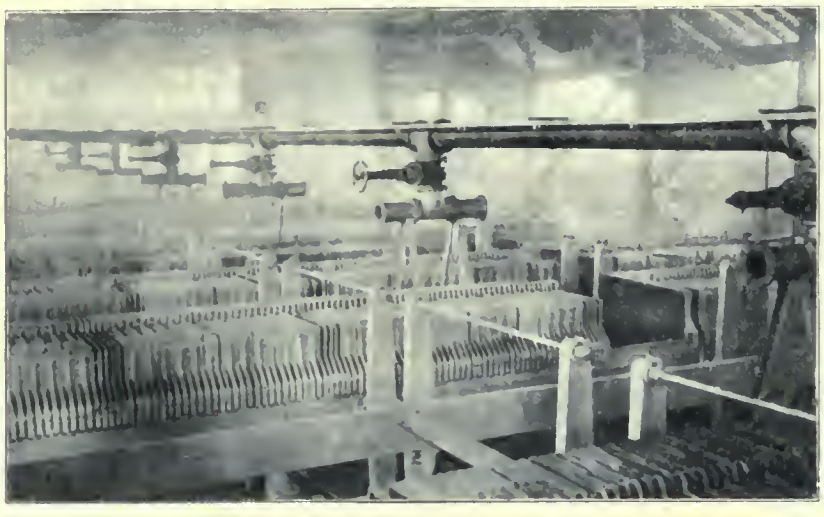
Stamps of 1,500-lb. weight are now in use on the Rand, and it looks as if the limit of weight had not yet been reached. But little has been heard this year of anvil-blocks for mortars, although at the Waihi Grand Junction they seem to have made for a considerable increase in output beyond that originally expected. Judging by output per horse-power, ball-mills would appear to be the most efficient machine, with an output of over two tons per h. p. day on the best types, crushing all the ore through 27 mesh, but the cost of dry-crushing at the South Kalgurli appears to be about three shillings per ton as against roughly 1s. 9d. per ton crushing wet at the Oroya-Brownhill, Lake View, and Ivanhoe. On the other hand the latter crush through very much coarser screening (10, 17, and 15 mesh respectively), reducing the oversized product by their pans and tube-mills.

Fine Grinding.—The tendency has been to use stamps for rough crushing only that is, to substitute coarser screens for those formerly in use, and from the pulp to separate the coarse product and to grind it in tube-mills or pans. There have been no notable contributions to our knowledge this year as to which is the best appliance for this purpose. Tube-mills seem to be generally employed, except at Kalgoorlie, where the roasted ore can be efficiently ground to the required fineness in pans. Not that pans are not effective on raw ore. On the contrary, the Ivanhoe results show very good work indeed, and it is to be much regretted that the comparative tests made at that mine between pans and tube-mills were carried out in such a way as to make the results worse than useless. But it is a matter for serious thought that the Ivanhoe costs for regrinding sand should be only 8½d. per ton treated, when the Oroya-Brownhill, Lake View, and other mills should show a figure twice as high. It cannot well be a matter of pans only, or we should have heard of similar low results from the other companies exclusively employing pans (at the Oroya and Lake View pans are used in conjunction with tube-miils). Is it that the Ivanhoe ore is softer or that the final product is not slimed as fine? The management has recently been very keen on reducing the value in their residue—and have succeeded in doing so materially—and one would therefore expect that they would not overlook the gain from crushing as fine as their neighbors. It is to be assumed, therefore, that the crushing is as fine; but the fact remains that the cost of grinding sand at the Ivanhoe is less than half that of neighboring companies of the same group that employ wet crushing. There is an obvious need of that careful comparative test between pans and tube-mills for which I have so often asked and which I hoped would be undertaken by Klug or Denny. Indeed, it was understood that the latter was making such tests, but nothing seems to have come of them.

Meanwhile I am informed that such a test has been made at Broken Hill with a pan, a wet-grinding ball-mill, a disc-grinder, and a tube-mill, and that the tube has proved itself the best of the lot, but in the absence of details we can only take this statement as the expression of individual opinion. Even if we assume tube-mills to be the best slime-makers there is still the question of

stage-grinding, and it is by no means certain that the preliminary crushing of the coarser particles could not be effected more economically in pans.

The best pan figures have been given above. The following tube-mill data will prove of interest. African costs have been reduced from 8½d. (per ton ground) down to 5½d., of which 1.89d. is for power, 0.7d. for pebbles, and 0.93d. for liners. Mr. Henry Leupold states that silex linings are half the cost and last two and a half times as long as iron liners. The Consolidated Gold Fields made careful tests on manganese steel liners as against silex, with the result that the former were shown to be more expensive and the grinding nothing like as good, owing to the slipping of the pebbles caused by the polished surface of the manganese steel. At El Oro, a 20-ft. mill with 7½ tons of pebbles grinds 125 tons per day of sand for 60 h.p. to such a fineness that 90% will pass 100-mesh and 50% a 200-mesh screen. At Waihi, an 18-ft. mill grinds 77 tons of 20-mesh sand per day, so that 93% will pass 150-mesh, for 37½ h.p. The Waihi is notorious for the hardness of its ore, which ball-mills failed to grind satisfactorily. Their tube-mills do not appear to be run to their utmost capacity, but their figures are interesting as an example in practice of direct tube-mill work, that is, without any return of material treated. The above figures, of over two tons slimed per horse-power, at first sight show a less duty than that mentioned by me a year ago, of four tons per horse-power in Africa, but it must be remembered that the African crushing was much coarser, they having at that time adopted a standard of under two per cent retained on 60 mesh.



Merrill's Filter-Presses at the Homestake.

But apart from the question of comparative cost of work done, tube-mills have shown their distinct economical advantage as well as their capacity for re-grinding. Reference was made last year to the huge additional net profit of £65,000 per year accruing to El Oro Company from this source. At Waihi three 18-ft. tube-mills and 90 stamps have increased the output from 2.89 tons per stamp per day to four tons, and have lessened the value of the residue by 50%. They have improved the extraction by amalgamation from 5 to 7%, and effected a 75% saving in screening. They find also that since the adoption of tube-mills the slime is more permeable and the filter-press charges take less time for treatment, so that the same presses can now deal with 30% more slime than before. The new Barry linings, made on the spot, seem to be most effective and to result in a great saving of cost over the imported silex. One set of linings is stated to last for six months, and a new set is always kept ready at hand and can be replaced in two days. Mr. H. P. Barry makes a great point of having his linings as rough as possible, so as to give a grip to the pebbles, and has modified his doors to effect this also.

At Johannesburg Mr. W. R. Dowling emphasizes the necessity for the complete separation of the sand to be re-ground from the slime in the mill-pulp, and for keeping the proportion of water to sand at as low a figure as possible. He shows at the Robinson Deep a 0.48 dwt. lower residue (formerly 1.26 dwt., now after tube-mill treatment 0.78 dwt.), and an increased capacity of 2,300 tons per month. The Eckstein mines, in addition to the increased output resulting from the tube-mills, show an additional profit of from 1s. to 1s. 6d. per ton (1s. at the Robinson, 1s. 4d. at the Ferreira) resulting from the increased extraction, which has lessened the value of the residue by about half a pennyweight. There are now 58 tube-mills at work on the Rand—and more on order—at 24 different mines, and these 58 tubes at the 24 mines only have increased the amalgamation returns of the whole of the Rand by three per cent.

At present the Knight's Deep appears to have the highest monthly output per stamp—for complete battery—of 7.68 tons per stamp, since reduced by the substitution of different screening to 6.68 tons. In Western Australia the Oroya-Brownhill crushes 7¼ tons per stamp through a 10-mesh screen, and the Great Fingall (1,150-lb. stamps) exhibits an average duty of seven tons per 24 hours through a 12-mesh screen, and the Sons of Gwalia at Leonora (1,000-lb stamps) treats 6.68 tons per head per day through 20-mesh screening.

Another View of the Merrill Presses.

It is estimated that, in addition to the gains already mentioned as resulting in Africa from the use of tube-mills, there is a saving of 30% in equipment arising from the adoption of them in place of obtaining the same out-

put by the addition of the increased number of stamps necessary.*

Amalgamation.—The increased extraction by amalgamation resulting from the use of tube-mills, has been referred to already. At Waihi, amalgamation is carried out on plates set in a large building apart from the mill, sand and slime being treated separately. There is much to be said for this arrangement. Companies circulating cyanide solutions through the mill find a scouring of their copper plates by the cyanide solutions. Denny, at the Meyer & Charlton, proposed to minimize this action if possible by adopting shorter plates, but probably the better method would be to exclude copper plates from the amalgamation apparatus. At the Lake View (Kalgoorlie), for instance, plates are discarded and amalgamation takes place in pans; in that mill 51% of the value of the concentrate is recovered by amalgamation and 46% by subsequent cyanidation.

Roasting.—Thomas Edwards has increased the capacity of his recent furnaces by a parallel system of rabbles, which is stated to promote inter-rabbling. G. C. Klug has adopted this for the Holthoff-Wethey furnaces at the Perseverance, and claims high results. Merton has also modified his furnace by making it a five-hearth roaster, and also of greater hearth-area. The Great Boulder Proprietary has a roasting cost of 2s. 3d. per ton (employing Merton furnaces) reducing an ore going 4 to 5% sulphur down to 0.07% sulphur, as sulphide; with this exception the record of the South Kalgurli type of Merton furnaces does not yet appear to have been improved on, either for cost (2s. 6d. per ton roasted), output (32 tons per diem for small-size furnace, taking 1½ h.p.), or efficiency (3.1% sulphur down to 0.01% sulphur as sulphide; one ton of green wood roasting 11 tons of ore). With regard to the suggestion that I made in this review a year ago of adding, say, two pounds of lead acetate per agitator charge (40 to 60 tons) of roasted ore, Richard Hamilton of the Great Boulder finds that the use of lead salts appears to result in an increased consumption of zinc in the precipitation boxes, as against which he benefits by a saving of roasting fuel, an increased tonnage through the mill for the same labor, a reduction in the value of the residue, and a general feeling of confidence in the ability to set foul roasts all right quickly in spite of fluctuations in natural draft.

Concentration.—There appears to be no great advance made this year in the concentration of gold ores. The difficulty remains that an attempt to concentrate out refractory particles from an ore usually leaves a tailing practically as refractory as the original ore.

It was hoped that fine sliming and the Wilfley slime-table might overcome this difficulty, but the latter machine is by no means perfect and maintenance is a most formidable item. So far the old canvas tables or frames appear to give the best results, but the cost of washing down is very heavy indeed—amounting in certain cases to 30s. or 40s. per ton of concentrate produced. A continuous rough rubber or canvas-belt table, somewhat on the Luhrig or Buss system, might solve the difficulty, though the capacity per unit would necessarily be small; or the old treatment table could have a traveling system of washing pipes worked by a water balance, and thus avoid the expense of so much boy-labor.

The flotation processes are being mainly applied to zinc-lead concentrate at Broken Hill, rather than gold ores. De Bavay and Simpson appear to have made an interesting discovery as to the principles involved in the various flotation processes, which they claim depend on the surface tension of sulphides as contrasted with the gangue, the greasy sulphides when wetted retaining an envelope of air that is expanded by heat, or by vaccuum, or aided by the air entangled in oil, or gelatinous silica, or by flowing the mineral pulp in very thin layers—practically all surface—over inclined tables.

Treatment of Difficult Ores.—Cupriferous tailing with a copper content not exceedining 0.5% is now successfully treated by leaching out the copper with dilute sulphuric acid and precipitating on scrap iron, as described by W. S. Brown.† With ores containing more copper—but not rich enough to smelt—a preliminary roasting of the ore has been found to improve matters. The addition of ammonia to the cyanide solution has been previously suggested and carried out in practice.

Auriferous antimonial concentrate, containing say 20% antimony and arsenic, has been successfully treated by an ordinary careful roast of the ore previously mixed with from 2 to 5% charcoal or coal, followed by a hot acid wash of dilute hydrochloric acid (obtainable by exposing old chlorine solutions to direct sunlight), and then lixiviating with cyanide or chlorine. A variation successfully employed is to roast as above, add salt at the end of the roast, and chlorinate. Both methods have yielded 90% extractions, but have the drawback of requiring very careful roasting.

Slime Treatment.—The brothers Denny have made something of a sensation at Johannesburg by the methods they have applied at their new plants. In these they have adopted the West Australian method of circulating dilute cyanide solutions through the mill and filter-pressing their slime in Dehne hydraulic-closed filter-presses. They claim a recovery of over 94% at a treatment cost, including cyanide, filter-pressing, and disposal of residue (5d), of 1s. 10d. per ton. As this carrying into practice of their proposed treatment scheme was not effected without many prophecies of failure, and as the cost of the installation necessary appears to be less than half that of the method of treatment locally in vogue, it is natural that their work should have received much attention, and as their figures do not seem to be seriously contested, the Denny brothers certainly look like scoring heavily again as the result of their enterprise and foresight, just as they did previously by the introduction on the Rand of tube-mills.

But perhaps the two greatest successes in slime treatment—as being a real advance on established filter-press practice—are the respective methods evolved by Ridgway at the Boulder and by Barry at Waihi. Anyone reading Mr. R. Gilman Brown's article* on the Moore filter, must have noticed the very sloppy badly arranged frames shown in the illustrations. We can understand, perhaps, from these illustrations, one of the reasons for the small success attending the Moore filter in America. At Walhi, Barry has a frame¶ which is much more effective than that shown in the description referred to above, and he has successfully treated many thousands of tons by his method of open-framed atmospheric filtration; but the drawback to this—as to the Moore basket-filter—is the necessity of having men constantly in attendance to clean the frames.

Charles Butters seems to have been alive to the defects of the Moore frame, and has got out one that he appears to be working with considerable success at Virginia City, as does also F. L. Bosqui at Tonopah. Butters, however, has apparently allied himself to the Cassel enclosed type of press, which looks similar to that referred to in a previous paper as being experimented with at Johannesburg unsuccessfully.

The Ridgway machine has now been in use for a year at the Great Boulder, and has treated some thousands of

South African Mines, October 27, 1906.

† *Proceedings* Institution of Mining & Metallurgy, 1906.

* MINING AND SCIENTIFIC PRESS, September 8, 1906.

¶ *The Mining Journal*, September 30, 1906.

tons of slime quite automatically and without any continuous supervision, and Hamilton, who has been testing it alongside his filter-press installation, is so satisfied with the results that he is laying down a plant to treat 500 tons per day—the largest slime plant in the southern hemisphere. The principle of the machine is a number of horizontal plates revolving round a central vertical post, which is really a tube, and to which pipes communicating with each plate are attached. Each plate has an under-filtering surface, and through a portion of its revolution it dips into the slime-pulp. A cake is formed by the application of a vacuum, and the plate in the course of its journey around its axis finds itself next in a water bath, where it remains sufficiently long for thorough washing. The cake is then dislodged automatically into the residue deposit system. This machine is certainly cheaper than filter-presses, both in first cost and in operation, and an equipment to do the duty of an African decantation plant should not only yield higher recoveries at a lower working cost, but should be installed for less than half the expense of the existing system.

Zinc-Dust Precipitation Press at the Homestake.

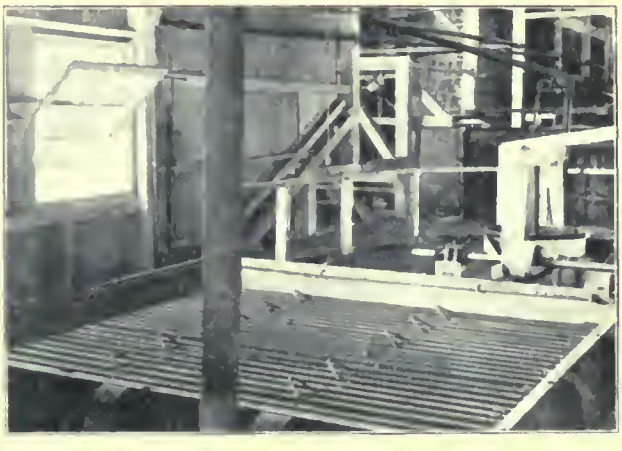
The frame being triangular, the solution and zinc dust, which enter together at the apex, are kept in constant agitation.

Of the other methods referred to last year but little has been heard. C. W. Merrill appears to be still at work on his hydraulic emptying filter-press, but details of successful work have not yet reached me. Philip Argall has a fixed frame and movable tank, but appears too busy at Cripple Creek to be able to give much attention to his slime-filter for the present.

In Western Australia one of the groups had a method of upward percolation of the solutions through the slime-pulp during agitation, but this method does not appear to have been attended with any great success. Generally speaking, it looks as if some direct method of automatic atmospheric filtration would displace both decantation and Dehne filter-pressing, although at the outset it will probably require a higher degree of intelligence for its effective and successful working.

Re-treatment of Tailing.—Not much has been said of the Stark process during the year. It seems to have been most profitably applied to the Crown Reef dump. Is it that there is any special characteristic feature of this dump that makes it suitable for the Stark process?

Butters Press at Virginia City, Showing Electrolytic Precipitation Boxes.



Top View of Butters Press at Combination Mine, Goldfield.

Mercuric Cyanide.—A reference to a test by Butters, on El Oro ore, of a mercury salt added to the cyanide solution, recalls the investigation made by the Cassel company (the owners of the cyanide patents) in 1895 into the use of this salt. They obtained improved results, on some ores, of 3½% greater extraction of the gold and 3% greater extraction of the silver, with a lower consumption of cyanide, but the tests were not continued, as the improved extractions seemed insufficiently encouraging in view of the additional expense of the added salt; but Butters' tests have renewed interest in the subject, and we hope for fuller data.

Moore Filter in the Standard Mill, Bodie.

Costs.—Tube-milling, fine grinding, milling, and roasting costs have been given above. The following tabulated statement of West Australian costs will show the progress still being made in that region by comparison

with those in preceding papers, as well as with those obtaining elsewhere:

Rock-Breaking.

Mill.	Pence.
Lake View	1.71
Ivanhoe	1.87
South Kalgurli (dry)	3.39

Milling.

Lake View	1s. 9d.
Ivanhoe	1s. 9d.
South Kalgurli (dry)	2s. 11d.

Concentrating.

Lake View	6s. 7d. per ton concentrated 9d. per ton milled
Ivanhoe	8s. 0d. per ton concentrated 10d. per ton milled

Roasting.

Lake View	3s. 10d. per ton roasted (concentrate only)
Ivanhoe	5s. 5d. " " " "
South Kalgurli	2s. 6d. " " (all the ore).
Great Boulder Proprietary	2s. 4d. " "

Fine Grinding Sand.

Lake View	1s. 10d. per ton ground.
Ivanhoe	8d. " "
South Kalgurli	1s. 3d. " "

Cyaniding by Agitation.

Lake View	3s. 1d. (Includes 1s. 4d. for KCy and 1s. 2d. for BrCy)
Ivanhoe	4s. 1d. (Includes 11d. KCy, 2s. 6d. BrCy, and royalty 2d.
South Kalgurli	1s. 4d. (Includes 7d. KCy.)

From the above it appears that the agitation treatment, less cyanide and bromo-cyanide, but including power, lime, labor, and supplies, costs roughly 7d. per ton (Ivanhoe 6d.).

Cyaniding by Percolation.

Ivanhoe	2s. 2 d. (Including 9d. for KCy and lime).
Great Fingall	11¼d. (Including 6d. for KCy and lime).

Filter-Pressing.

Lake View	1s. 7d.
Ivanhoe	1s. 6d.
South Kalgurli	1s. 6d. per ton filter-pressed.

The cost of filter-cloths at the Lake View Consols has been under ½d. per ton pressed for every month this year, save once when it was under ¾d.

Total Treatment Costs.

Ivanhoe	9s. 0d.
South Kalgurli	11s. 3d.
Great Boulder Proprietary	11s. 6d.
Great Fingall	6s. 11d.
Sons of Gwalia	5s. 2d. per ton treated.

General.—The battle of the processes at Kalgoorlie is now over. It is admitted that the all-roasting process gives the most profitable extraction, but the good fight made by the wet-crushing bromo-cyanide party, and notably by the Ivanhoe, has been of the greatest service to the industry, and the Ivanhoe's costs are such as to reflect great credit on the management and the staff; but the fine showing made by the South Kalgurli, the Great Boulder, the Kalgurli, and other companies, appears now to have convinced even the former advocates of bromo-cyanide.

EVEN if our education can never be complete, still we ought to strive to develop ourselves along as broad lines as possible. If time and means are limited then an arbitrary narrowing is necessary, and more reliable and useful results are obtained by concentrating the efforts upon one subject than by dissipating them among several. For every carefully investigated and thoroughly understood truth is an accurate and reliable standard by means of which all other knowledge may be tested; whatever stands in direct contradiction is certainly false, even if the errors cannot be clearly demonstrated. Above all should the scientist strive to reach this position, and after mastering one truth should seek to make his circle of knowledge ever wider and wider, with the consciousness, however, that his task is endless and that his aim can never be fully realized.

Quicksilver in California.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES G. YALE.

The quicksilver industry of California cannot be said to be in a flouishing condition; indeed, the production during the year 1906 is estimated to have been about 2,000 flasks less than in 1905, when the output was 24,655 flasks of 75 lb. each, valued at $886,081. Prices during the past year have been exceptionally low, being from $39 to $40 per flask for domestic orders, and from two to three dollars less for export. Fortunately for the producers, the exports to China and Japan have been exceedingly light, and therefore most of the quicksilver sold has brought the full domestic price. For this reason it is probable that the quicksilver miners have received as much value for their product, even at the lessened price, as they did when more was exported. Mexico, which is one of the markets for this metal, has very materially decreased its demand, because the Mexicans are working their own mines in these days and prefer to use what they produce themselves.

The demand for quicksilver for domestic consumption has been gradually but surely decreasing, since the cessation of silver mining and the general adoption of the cyanide process. It is hoped now, however, that, with the increase in the price of silver, more of the mines of that metal will be operated and an increased demand will ensue for mercury. The yield of the California mines has just about kept pace with the domestic consumption. Some of the smaller mines have stopped work. Indeed it is only the larger ones that can afford to be worked at the present prices, and with the comparativcly small demand. In fact, it is common report that only one mine in this State is now paying dividends, this being the New Idria in San Benito county, which is yielding between 500 and 600 flasks per month. A few other mines, such as the New Almaden and the Socrates, are slightly increasing their output, while others once considered large producers are not doing half what they did a year ago. Several of the mines in San Luis Obispo county have shut down for the present, and very few new ones have been opened in any part of the State.

California has long been known as the largest producer of quicksilver on this Continent; in fact, it was the only producer in the United States until a few years ago, when the quicksilver deposits of Texas were opened. During the last 19 years California has produced 550,154 flasks of mercury, valued as a total at $22,503,131. While of late there is some little increase in demand in the Eastern States, it is not yet enough to affect the market to any great extent. If, however, the silver mines start up again and the amalgamation process is used, there will be more demand for mercury. This demand may be readily met because the mines can easily increase their output, if there is any incentive to do so in the matters of price and consumption. For the present at least, there seems to be very little money in the business of mining quicksilver and it is not probable that any new deposits will be opened unless there is a material change in conditions.

As I am not a smoker I have formed another habit to kill time—namely this habit of general reading, and am accustomed in this way, to make use of my "lost quarter hours" (*e. g.* the kind which elapses between the moment when dinner is announced and when it is served). It would be impossible for me to count the number of occasions on which I have, in this manner, obtained ideas that, in one way or another have helped me to overcome difficulties, which for a long time, had seemed insurmountable.—*W. Ostwald.*

Cobalt, Ontario.

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD.

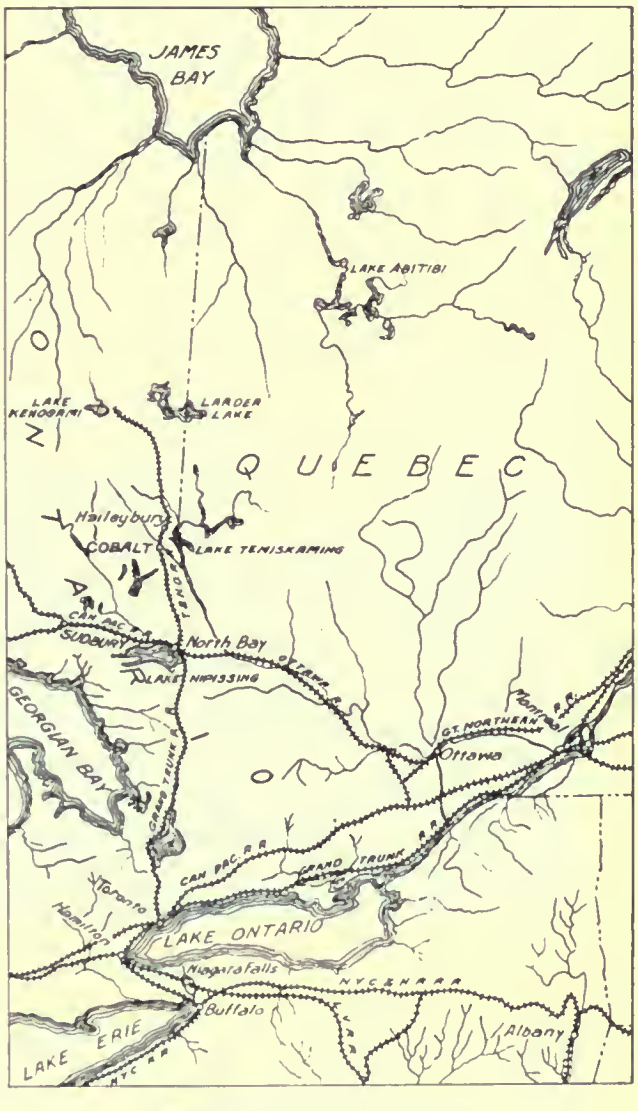
So much attention has been drawn to this new mining district in Canada that the accompanying illustrations are bound to prove interesting. Cobalt was discovered in October, 1903, the first ore having been exposed during the building of the Temiskaming & Northern Ontario Railway, reaching from North Bay on the Canadian Pacific Railway to Haileybury, on Lake Temiskaming. Cobalt is 103 miles north of North Bay, and 980 ft. above sea-level. It is a notable fact that just as the excavations for the railroad laid bare the veins of Cobalt, so also those made for the line of the Canadian Pacific were the cause of the discovery of the nickel deposits at Sudbury, which is 90 miles southwest of Cobalt. The shore of Lake Temiskaming has been an established route to the north for more than two hundred years and it is curious therefore that the rich outcrops at Cobalt—only four miles distant—were overlooked. On the east side of Lake Temiskaming there is a deposit of argentiferous galena that was discovered by *voyageurs* 150 years ago, for it is marked on a map dated 1744. The actual recognition of valuable ore at Cobalt is to be credited to T. W. Gibson, director of the Ontario Bureau of Mines, who was given a sample of niccolite in October, 1903; the man who gave it to him thought it was copper ore. This specimen was sent to W. G. Miller, the Provincial Geologist, and led to an inspection of the district in November. The first authoritative report—by Prof. Miller—was issued in the same month, but no particular interest was aroused until more than a year later, that is, early in 1905. During that year the shipments of ore aggregated 2,144 tons, containing 2,441,421 oz. silver, 118 tons of cobalt, 75 tons of nickel, and 549 tons of arsenic, the total value being $1,468,524. The average value of this ore was $684.94 per ton.

The dominant geological formation consists of metamorphosed fragmental rocks of Lower Huronian age—principally conglomerate, breccia, and slate. The veins occupy nearly vertical planes of fracture that traverse this formation and, to a minor extent, both the older Keewatin schist and a diabase that penetrates the other formations. The workings of all the shipping mines are in the Lower Huronian, but some veins carrying pay-ore have been found lately partly or wholly in the Keewatin. At first it was feared that the deposits would cease when the fractures passed into the underlying formation, that is, that they would be confined to a maximum thickness of 500 ft., but this geological factor is not now so important.

The principal ores are native silver, smaltite (cobalt arsenide), niccolite (nickel arsenide), and mispickel (arsenical pyrite). There are also a number of those beautiful minerals usually found in the oxidized portion of nickel-cobalt lodes, such as the splendidly red erythrite (hydrous cobalt arsenate) and the apple-green annabergite (nickel arsenate). The sulphides of silver (argentite) and of nickel (millerite) also occur, but arsenical minerals are distinctly predominant over sulphides. Antimony, as stibnite, is found; indeed, there is an authenticated story of a carload of ore that was supposed to be worth $15,000 and which on being sampled at New York was found to assay only $8 per ton, because antimonial ore had been mistaken for silver ore. This incident upset a big mining deal and was the cause of a celebrated fiasco.

Native silver occurs generously, in flakes, sheets, wires, and in masses of unusual size. It commonly contains some antimony and occasionally bismuth. The silver antimonide (dyscrasite) is associated with the native silver. Argentite occurs frequently and is easily recognized by its dark color and sectile quality. The predominant matrix is calcite, not quartz; therefore, any seam of calcite is accepted as a leader to be followed in the search for valuable ore.

Mining has led to a partial clearing of the pine forests that formerly covered this region, most of which had previously been denuded of its first growth by the lumbermen. The surface is largely covered with drift, consisting of gravel and boulders from three to six feet thick; even the outcrops of rock are usually clothed with moss, so that prospecting is difficult. Explorations are started by trenching, followed in most cases by an underhand stope that determines whether it is worth while to sink a shaft. The contour of the ground is uneven and hills rise to a



Map Showing Portion of Cobalt.

height of a hundred feet or more. There are many lakes and on the shores of these, natural sections of the formation may occasionally be seen. Calcite is the chief indicator, and the white seams of this mineral serve as a guide to the prospector. Outcrops of ore are not easy to detect; they show native silver (tarnished by oxidation) and cobalt bloom (erythrite), the latter having a pink color that strikes the eye, but it is sometimes mistaken for tints of iron oxide. Argentite has been mistaken for lead, but it is black and can be cut with a knife. Owing to the excessive richness of the ore, even thin veins are worth following and by breaking the adjoining rock other veins have been discovered.

The story of the development of this mining camp is full of picturesque incidents. Immediately south of the Cobalt mining area there was a timber grant held by the Gillies Bros. This 'timber limit' covered one hundred square miles, the extreme northern portion of it extend-

ing to within half a mile of the town of Cobalt; it was known to be rich in silver-cobalt ore. When the local excitement began, this tract was over-run by prospectors who expected it to be thrown open to mining, so that a strong force of constables was required to guard it. In the early part of 1906 the lumbermen who had this timber license began to cut down the pine forest, and it became apparent that when the area had been cleared—in October—there would be an unprecedented rush and many legal complications, because the place of rich mineral outcrops was so well known as to invite a general scramble, with possible violence and even bloodshed. The disposal of the mining rights by public auction was advocated, but in the end the Government avoided the threatened trouble by deciding to work the tract in behalf of the Province, that is, they made it a Government mining property, which is now being operated successfully under the direction of the Provincial Geologist, Mr. Willet G. Miller.

Mining claims are usually rectangular pieces of ground, each covering forty acres, with vertical side and end-lines. Many prospectors had staked claims in winter, when it is practically impossible to make genuine discoveries of mineral, and in such cases the locations were disallowed by the Inspector of Mines. In June the Government obtained a judicial decision, setting aside leases covering 120 acres obtained by false declaration of mineral discovery. Other similar proceedings caused much uneasiness among claim-holders who had secured locations through fraudulent affidavits. The Nipissing Co. was thus threatened in July, but the management was able to satisfy the Government that the company had purchased the ground in good faith without receiving notice of any defect in the title. This episode had a reassuring effect. In November a similar case against the owners of the O'Brien mines (a rich property of 140 acres) was settled, after some litigation, by a compromise, the O'Brien Syndicate getting a clear title upon agreeing to pay the Government a royalty of 25% on the output. This compromise aroused adverse criticism; it indicated the intention of the Government to secure a larger share of the profits from the mines for the people of the Province as against foreign corporations.

In July, the Temiskaming & Northern Ontario Railway Commission, which was authorized to dispose of the mining rights of the Cobalt townsite and the railroad right-of-way (about 60 ft. wide), leased the mining privilege between the 101 and 105 mile-posts to the Right-of-Way Mining Co., which secured a 999-year lease, paying a bonus of $50,000, and agreeing to give royalties ranging on a sliding scale from 10 to 50%. The arrangement created much unfavorable comment, because the terms as advertised had called for a flat rate of 25% and the principal promoter of the company was a son of a member of the Commission. In consequence, the Government canceled the agreement and called for fresh tenders on the basis of a flat royalty of 25%. Only one tender was made, by a syndicate that included three of the original company, and this was accepted. In November and December ore assaying several thousand ounces of silver per ton was taken out of this ground, which is proving to be a valuable mining property.

Silver Queen Mine in Foreground, McKinley-Darragh Behind It; and the Nipissing Near Head of Cobalt Lake.

In November a part of Cobalt lake was drained by the McKinley-Darragh Co., which built a coffer-dam, so as to facilitate the working of veins in the bed of the lake. In December, the Government of Ontario, becoming aware of the value of the lake beds, offered for sale the right to mine under Cobalt and Kerr lakes. The former covers 50 acres, of which four acres had already been sold to the Nipissing company; the latter covers 40 acres, of which 17 had been disposed of. The mining rights to 46 acres of Cobalt lake were actually sold by the Provincial Government for $1,085,000 cash. Kerr lake was not sold, the highest bid being $51,500, which was considered insufficient.

At the beginning of September some extraordinary discoveries in the Nipissing mine added to the fame of the locality, for a new vein that had been uncovered at a place where it was 18 in. wide, was followed on the surface until it opened out to a width of five feet, most of

it being pure silver. This is the now celebrated No. 49 vein. A chunk, weighing 800 lb. and containing 70% silver, was removed at this time, and subsequently it was proved to be part of a mass weighing 3,000 lb. and worth $25,000. These discoveries were due to a novel system of prospecting adopted by the Nipissing Co. In May the management had erected a hydraulic plant on Peterson lake; this was used to wash away the surface soil, so as to lay bare the rock and expose the outcrops of ore. In October there was another phenomenal discovery of a vein 10 in. wide, which was uncovered for a distance of 50 ft. and yielded ore, half of which was silver. In consequence of these rich finds the stock market became excited at this time and quotations on the Curb at New York rose rapidly, culminating in a price, for Nipissing, of $34.50 per share. Many speculative purchases of unproved ground were made by promoters, from $50,000 to $100,000 being paid for claims that had no mineral showing. The capital of the various companies placed on the market reached $200,000,000, a sum wholly out of proportion to the output of the camp. Up to the present time the total shipments of ore are estimated to have been worth $5,250,000.

Referring to the accompanying photographs, that of the Abitibi mine also illustrates the forest of small pines as it appears in early winter. Cobalt lake, ice covered, with the McKinley-Darragh mine-buildings, is shown in another. The largest photograph gives a good idea of the district as it looked a couple of weeks ago, and indicates how the forest is being cleared in the wake of mining operations. The picture of the town shows that Cobalt has grown out of its early uncouthness and is now a compact settlement. It is an orderly place; respect for law is general, by reason of an excellent judicial administration and an efficient police. The town has good hotels, heated by steam and illuminated by acetylene. At present the population fluctuates between 5,000 and 6,000. In winter the thermometer registers between 15 and 40° below zero, but with proper clothing even this is not unpleasant, in the absence of wind.

The future of Cobalt will be solved by actual mining; by its resemblance to the Chalanches mines in France, and by reason of the extreme richness of the ore and the character of the fissuring, one would not venture to predict persistence to great depth, but the facts of mining will always over-ride analogies or theories, and of facts the most encouraging is that La Rose mine has a shaft 300 ft. deep, from the bottom of which a diamond-drill bore was put down 200 ft. further,

The McKinley-Darragh Mine.

in good ore all the way—the last statement requiring confirmation. Nevertheless, it is opportune to point out that in nature the excessive richness of a deposit is not usually characteristic of large and persistent bodies of ore.

Apart from its own production, Cobalt is doing good service to Canada by encouraging exploration in the country northward, west of the line that separates Quebec from Ontario—a region now termed New Ontario. Already finds of mineral have been made near Chibugamoo and Temagami, also on lakes Opastica, Wendigo, and Larder. These have encouraged the building of the railroad into the north country, and they promise to lay the foundations of an important mining industry in a part of the American continent hitherto almost unknown.

The Town of Cobalt, Ontario.

The Abitibi Mine and the Pine Forest.

AFTER the rivers freeze all mail to the interior of Alaska and Nome and St. Michael goes by way of Valdez. From here it is taken by two routes inland, the one reaching Nome and St. Michael via Fairbanks, and the other via Eagle and Tanana. The mail via Fairbanks leaves twice a week, Mondays and Thursdays. Via the Eagle route the mail leaves but once a week from Valdez.

The Mineral Industry of California During 1906.

Written for the MINING AND SCIENTIFIC PRESS
By LEWIS E. AUBURY, State Mineralogist.

During the past year in California a greater amount of development has taken place in the many different mineral products that the State contains than at any time in its history, and all branches of mining have shown a healthy condition.

Gold Mining.—Gold continues to take the lead in the mineral development of the State, and much new territory has been opened during the past year, notably in the desert area—in San Bernardino, Inyo, and Mono counties—bordering upon Nevada. The rich discoveries made in southwestern Nevada are partly responsible for this development, as well as the construction of three new lines of railroad that have given transportation facilities, the lack of which has so long retarded the exploration of the desert region. The mineralized zone that exists on the eastern side of the Nevada line has been found on the California side, and much activity is now apparent in testing the many prospects recently discovered.

In the northern portion of the State hydraulic mining, unaffected by the anti-debris law, continues successfully; a number of new companies have been operating in Siskiyou and Trinity counties. The output of hydraulic mines will probably compare favorably with that of the previous year ($975,000). A number of new gravel mines have been opened, and drifting is now in progress to tap the channels. The output from the drift mines will not exceed that of the previous year, but the work now under way will increase the yield of 1907.

Several new dredging companies entered the field during 1906, and a number of new dredges have been built. New areas are being exploited, particularly in Butte and Yuba counties. From present returns, the various companies operating appear to have had a prosperous year, and the total output of gold exhibits a healthy increase over the previous year ($3,276,145) and it is expected that the platinum saved on the dredges will much exceed that secured in 1905.

Quartz mining has exhibited increased activity in Siskiyou, Shasta, and Trinity counties. This is partly due to the demand for silicious ores at the copper smelters. In Del Norte county a new mining district has been organized and promising prospects are now being worked. Nevada county, as usual, takes the lead in the amount of gold produced. The old mines continue to yield their regular quota of the yellow metal, and the profitable ore continues to the deepest workings. New prospects have been discovered and several old mines have been reopened in Placer, El Dorado, Tuolumne, Mendocino, Calaveras, Madera, Fresno, and Kern counties. Altogether, from the product of the quartz mines of the State, there is reason to believe that we are not losing ground, but that we are continuing to advance. The gold-mining industry in this State is established on a firm foundation. Our mines continue to produce steadily and with the almost total extinction of fraudulent operations, there is an increase of confidence and a constant demand for mining investments.

California's total yield of gold from 1848 to 1907 is far in excess of one billion and a half dollars, and the steady output of the metal, which now approximates over $19,000,000 yearly, gives no indication of diminution.

Copper.—It is my opinion that a much larger production of copper was made in 1906 than in the previous year. The exceptional demand for copper and the high figure at which copper has been quoted for some time past has stimulated prospecting and many properties that had been closed down were reopened and several new finds have been made. Of these the most interesting are the discoveries in the Greenwater district of Inyo county. It is too early to predict the possibilities of this district. Its remoteness from transportation facilities and water have retarded its development, but notwithstanding the many difficulties encountered, very active work is being prosecuted on about 50 different properties. During the next six months, exploratory work will have probably progressed sufficiently to determine the persistence of the ore deposits. Promising prospects are also being opened up in Siskiyou county, and it is probable that the copper belt of Shasta county will be found to extend through Siskiyou and even to the Oregon line. Shasta county, however, still continues to lead in amount and value of copper product. During the past year, the Mammoth smelter at Kennet was blown in and has been running steadily. A railroad has been planned to connect the Bully Hill and Great Western smelters with the Southern Pacific railroad, and if constructed, the delays heretofore existing in the transportation of coke, will be overcome, and a more steady production assured. The Mountain Copper Co. has been shipping most of its ore to the works at Martinez, but may resume operations at Keswick in the coming year. In Calaveras, Placer, Fresno, Mariposa, and Nevada counties, much active work has been prosecuted and all of the above counties will probably show an increased production.

Quicksilver.—California furnished the bulk of the quicksilver produced in the United States in 1906. No unusual demand was made for this mineral during the past year. On this account no particular activity was displayed in developing any new territory, the chief developments being confined to San Luis Obispo, Santa Clara, Lake, Napa, and Sonoma counties.

Borax.—One of our important industries, and one which is constantly growing, the product being obtained from San Bernardino county, is borax. Most of it in recent years has been obtained from near Daggett, but, owing to the great demand, it has been found necessary to re-open the deposits of Death Valley, in Inyo county, and in order to obtain better transportation facilities, a railroad is now in course of construction to that point from Ludlow. This road will also tap the nitre deposits, as well as an undeveloped region abounding in great mineral possibilities.

Soda.—All of the soda so far produced in California has been obtained from Owens lake, in Inyo county. Although large surface deposits have been found in San Bernardino, Riverside, and Kern counties, they have not as yet been worked. California contains practically inexhaustible quantities of soda, both in the carbonate and sulphate form. The soda deposits only await the touch of capital to transform them into profitable producers. Yet, with an abundance of raw material in our State, we annually import from Michigan and New York many hundred thousand dollars' worth of soda products. Working chemical tests have been made on the desert soda, and from them it has been demonstrated that a product can be obtained fully equal to that of the imported article. The amount of crude soda produced last year will probably exceed 15,000 tons.

Structural Materials.—The advancement which has been made in the exploitation of structural and industrial materials may be particularly mentioned, and a marked increase in the amount and value of these substances will probably be noted when the official statistics have been completed.

The calamity that befell San Francisco in April last is largely responsible for this development, as the necessity for an immediate supply of the different classes of material employed in the reconstruction of San Francisco

caused investors from all over the United States to investigate the possibilities of securing in California the raw materials for the manufacture of cement, terra cotta, tiling, pressed and glazed brick, and other clay products; also, marble, sandstone, and granite for building purposes. The majority of the clay deposits and quarries already opened being called upon to supply the unusual demand, they have been actively worked with increased forces.

The three cement plants—at Cement, Vallejo Junction and Colton—have had more than they could attend to in supplying material for home consumption. Another large cement plant has been established near Santa Cruz, and others are contemplated.

Gypsum has also been in great demand, chiefly for the manufacture of plaster of paris. A large amount of this material has in the past been imported from other States, but during the past year many deposits have been opened in this State. Some of the largest deposits of gypsum in America, and of the finest quality, have been found in southern California, but on account of distance from railroad transportation, it has not been found profitable to exploit them.

California builders are beginning to appreciate the qualities of slate, particularly for roofing purposes, as its superiority in the Coast climate, and its fire-proof qualities over other material commonly used, appeal strongly in its favor. The greater part of the slate produced came from El Dorado county, although work has been prosecuted in several new quarries.

The glass industry offers exceptional opportunities for profitable investment in California, as most of the plate and window glass used in this State is imported from Indiana and Pennsylvania. Several bottle-glass manufactories are in operation, and the output of these plants will doubtless show a marked increase in production for 1906.

Magnesite mining has also shown a decided advancement during the past year, and the demand for this material is largely increasing. Up to 1906, its principal uses in this State were for the manufacture of carbonic acid gas, the residue being shipped to the paper mills. During the past year, plants have been constructed for the manufacture of magnesite bricks, tiling, and plaster compounds. Magnesite was mined principally in Tulare, Alameda, and Stanislaus counties, although existing in several other counties of the State.

Rubble for road work (macadam) and for concrete has shown a large increase in the amount of production for 1906. The 'good roads' movement throughout the State is partly responsible for this increase. The large amount of concrete construction both in northern and southern California has also added to the consumption.

Other Industrial Minerals.—Besides the minerals already enumerated considerable prospecting has been done during the past year for asbestos, mica, pyrites, tungsten, and talc, all of which will probably show some increase of production over that of 1905.

All of the industrial minerals without exception appear to have attracted more interest than formerly. A renewed demand for antimony, chromite, bismuth, mineral paint, lead, and manganese has been apparent during the past few months, and many inquiries have been made at the State Mining Bureau for feldspar (to be used for glazing pottery) and for clay products generally. Special interest has also been directed toward high-grade clays from which porcelain and china ware can be manufactured. California annually imports thousands of dollars worth of this ware, and as the finest qualities of clay suitable for the purpose are obtainable here, it is probable that in the near future manufactories will be established.

At San Diego a movement is on foot to erect a chemical plant for the manufacture of lithia compounds. A large amount of this substance has been developed near Pala in San Diego county, and for years past the product has been shipped to Germany for chemical treatment.

Petroleum.—For a number of years this product has shown an increasing output, and this increase will be marked in the statistics for 1906. A greater demand was created during the closing months of the year than at any previous time. This was doubtless due to the large contracts entered into with Japan, and the completion of the pipe-line across the Isthmus of Panama, through which petroleum will be piped and supplied to the Atlantic Coast. Shipments are now being made to the Pacific terminal. The outlook for better prices is evident in the exceptional demand. A large amount of new territory is being prospected, and many new wells

California.—Showing Position of the Counties.

are being sunk in the proved districts. Owing to the low prices that formerly prevailed, and also to overproduction, comparatively little prospecting had been done for some time, and many strong producing wells were capped, but now all of this is changed, and every effort is being put forth to supply the present demand.

The superiority of California asphalt has created a demand for it outside the State. Most of the asphalt is obtained as a by-product in the refining of petroleum. One of the principal uses to which it has been applied has been in street pavements and roofing, although in the near future it will doubtless enter largely into the manufacture of new fuels. The demand for asphalt has been greater than ever before, and the supply has barely met the demand. The requirements for the coming year will undoubtedly require the re-opening of several bituminous rock deposits in southern California that of late years have been closed. The output of asphalt will unquestionably exceed that for the previous year.

Fuel.—Since the development of the petroleum industry, the mining of coal in California has not been active, and the greater economy in the use of petroleum for steam-making purposes has been the cause of many coal mines closing down or decreasing their output. However, owing to the advance in the price of petroleum

during the past two months, and the exceptional demand for coal for domestic purposes, the output of coal mines has been increased lately.

Iron.—California has long been known to possess large deposits of iron ore and of a character that will compare favorably with the Michigan ores, but the iron deposits of California have attracted comparatively little attentiou on account of the fuel problem. Owing to the high cost of a suitable coke, it has been found unprofitable to smelt iron ores in this State and compete with the Eastern market. To overcome this difficulty many useless attempts have been made to smelt iron ores with California petroleum—without regard to metallurgical laws.

A plant is now in course of construction in Shasta county for the reduction of iron ores by electricity, using the Heroult process. Experiments on a small scale with this method have proved successful during the past year in Canada, but granting that it will prove a metallurgical success on a large scale, it remains to be seen if it can be made a commercial success, when the cost of electrical power is taken into consideration.

The reduction of iron ores in this State has been given grave consideration for some time past by some of the most able metallurgists in both the United States and Europe, the question has been considered in all its phases and experiments are continually being made to solve a problem which means much for the industrial advancement of the Pacific Coast.

Experiments are now being conducted in the manufacture of an artificial coke. California coal (lignite) enters largely into its composition, combined with petroleum and other products. The difficulty of utilizing a lignite that contains a large percentage of ash appears to have been overcome by grinding and washing previous to its incorporation with the other ingredients. Small lots of the manufactured coke appear to have the necessary qualities, as to strength and fuel properties, but only demonstration on a large scale will prove its efficiency.

California peat has also received increased attention, and large areas of peat-bearing lands have been purchased with a view to supplying a demand for domestic fuel. Many schemes are now on foot whereby peat will be used both in a compressed form and in conjunction with petroleum. One factory is about completed on the bay shore in which peat-petroleum and briquettes will be made. Preliminary tests of the new fuel have demonstrated its value both for domestic and steam-making purposes. In southern California it is proposed to erect a plant for the manufacture of compressed peat-blocks for fuel purposes.

Gems.—The gem industry of California continues to grow, particularly in San Diego, Riverside, San Bernardino, and Tulare counties. The output of tourmaline, kuntzite, beryl, topaz, aquamarine, turquoise, garnet, and other gem-stones continues to be greater yearly, and operations formerly of small consequence are now developing into an important industry. Outside of the product of the gems above mentioned, companies have been organized during the past year to mine for diamonds in Butte and Amador counties. The gem product of 1906 will exceed that for 1905 ($148,500).

Official figures of production are not compiled before June of each year by the State Mining Bureau, hence it is impossible to furnish accurate statistics of production at this time.

EVERY true scientific discovery is the result of a natural process of development, which leads, through more or less numerous errors and misconceptions, to a definite and lasting result.

The Copper of Shasta County, California.

I.—Geology.

Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

The copper region of Shasta county is about 30 miles long and a few miles wide; it may be compared to a crescent with Iron Mountain at the western end and the After Thought mine at the eastern extremity. While the whole area is mineralized, the productive districts are limited to two smaller zones, each having characteristics of its own. At the western extremity are the large masses of heavy sulphide, which must first be considered in detail. This district includes the Iron Mountain, Balakalala, Trinity, and Mammoth mines, and a number of prospects from which important developments may be expected in the future. These deposits occur almost entirely in acid volcanic rocks, notably a rhyolite made up of a succession of irregular flows and tuffs that have been so compressed and folded as to render obscure the original character of the mass. When fresh the rock is gray, generally with distinct phenocrysts of quartz, and in the neighborhood of zones of mineralization it is highly impregnated with pyrite or an iron stain. Flow structure may be noted and the effect of quick cooling, which finds expression in a hexagonal structure, while brecciation and tuffaceous masses are common and especially noteworthy on the summit of Iron Mountain.

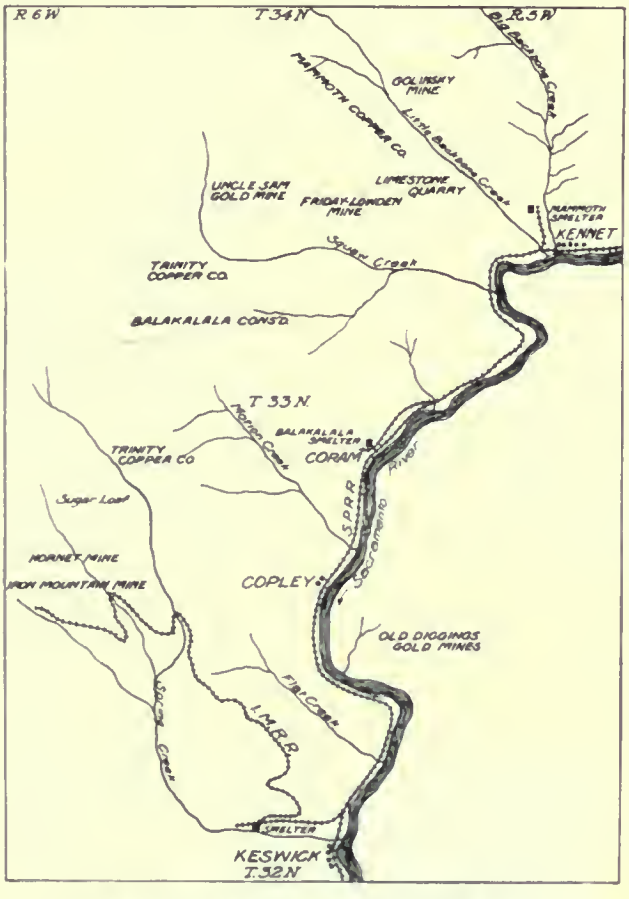
The petrographic structure of the rock is simple, though, in the field, it is apt to prove deceptive. At one place, the large phenocrysts of quartz will be found several millimetres in diameter, while quite near will be found an apparently granular specimen of a uniform gray color. This lack of porphyritic structure is often more apparent than real because, by careful investigation, the phenocrysts of quartz are plainly visible.

The rhyolite occurs in many phases, sometimes assuming a dark green color owing to alteration and at times grading into a meta-rhyolite.* On the west, the rhyolite is bounded by shales and conglomerate of Devonian age, but its age relative to the sedimentaries is not easy to determine. These have not been productive of copper. There is, however, one occurrence of sulphide ore carrying copper and precious metals, exposed in the Lone Star mine, a slightly developed prospect, which is of interest as being the only contact deposit in this district. In this case, the copper deposits seem to be limited to the rhyolite.

The principal deposits of the district lie on well-marked lines of shearing and mineralization. These are numerous, but no definite relation can be traced between them, though individual zones may extend for a mile or more. Iron Mountain may be considered in detail as being typical of the ore deposits of the district and because it has been so thoroughly explored. In the course of mining, miles of adits have been driven and over nine miles of diamond-drill holes have been bored. Mineralization has taken place very generally within a wide zone that has been subjected to great shearing and fissuring. This is readily seen by the brown stains and casts from decomposed pyrite and the secondary silicification, which produces the bluffs and jutting crags that characterize these mineral belts. This secondary silicification is a matter of the utmost importance, because the pres-

*A microscopic examination of the rhyolites of Iron Mountain indicates that they are all closely related, though differing widely in the degree of alteration. Silicification is very marked, and, in extreme cases, the rock has the aspect of a quartzite remarkably like some sedimentaries. In this rock, there are traces of mica that show faintly the structure of the rhyolite, and some crystals of pyrite are sprinkled through the mass. Phenocrysts of quartz may be absent in this phase, but in almost all others they are well marked. Dark green varieties of these rocks occur and have been mistaken for basic rocks, but they are merely a phase in which considerable quantities of chlorite surround the quartz phenocrysts. Many specimens exhibit the effect of shearing and fissuring, and present schistose structure with sericite.

ence of veinlets of silica, or an increase in the percentage of silica is often an indication that an orebody or, at least, an impregnation of sulphides is near. Silica determinations in drifts approaching orebodies will corroborate this, while the excess silica may often be seen occurring as veins of quartz near the ore. Economically, the ore-



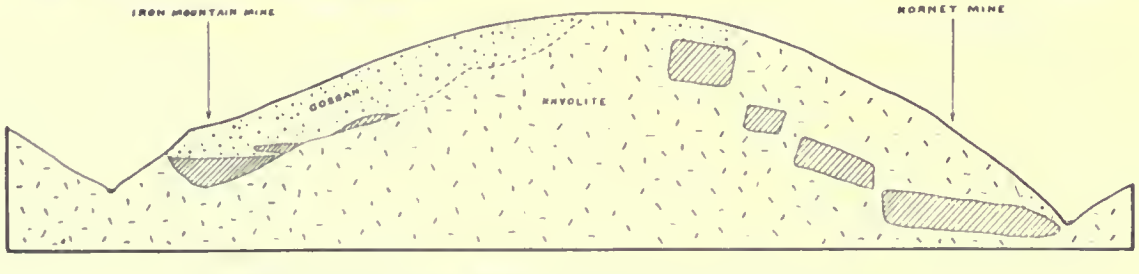
Map of a Part of Shasta County, California.

bodies themselves may be considered to be of two types, though geologically they are identical. There are the high-grade or 'basin' deposits, such as that of Iron Mountain, and the low-grade masses such as that of the Hornet mine. The only difference is that the former exhibit secondary enrichment, while the latter do not.

The Iron Mountain orebody is shaped roughly like a ship heading northeast with overhanging bow and stern and a round bottom. Its sides are bounded by two great fissures, within which the whole mass of rock, about 600 ft. long and 300 ft. wide, has been replaced by sulphides. These two fissures converge in depth and the east wall cuts off westward, forming the keel of the ship. The upper levels have been entirely oxidized, but the precious metals have remained, while the copper has sunk and enriched the sulphide zone, the secondary enrichment decreasing in depth.

The ore shows this in the bands of chalcocite and chalcopyrite, which, with covellite, may be traced in the ore of the upper levels. Assays also exhibit a slightly decreasing percentage of copper as depth is attained. It is interesting to note that the sulphide zone has a very well-marked and horizontal top, although the mass is situated on a steep hill, suggesting that the oxidation must have taken place long ago before the topography had obtained its present form. That these are merely due to the replacement of great masses of country rock is proved by the presence of crystalline quartz-phenocrysts from the rhyolite, which are found in the silica residues on dissolving the ore. In the massive croppings numerous phenocrysts may be seen and all stages of replacement observed, and, in the sulphide ore, the fissure system of the rhyolite may sometimes be traced. Further evidence is found in the unaltered porphyry filling occurring in certain fissures in the pyrite masses, which have apparently withstood impregnation owing to their impermeability. Why certain masses of rock have been so utterly pyritized, while others show little or no alteration, is unaccountable.

In tunneling into these bodies, one passes from a barren silicified rhyolite to a thick clay gouge behind which is a smooth and undulating wall of heavy sulphides. There is little or no warning until the wall is reached. The bottom is the same; in fact, the wall merely flattens out. It will be natural to wonder what becomes of these great fissures in depth and whether there are any productive veins that acted as feeders to these lenses. It is noteworthy that no mining has been done below the gulches and no shaft has been sunk in the district; in fact, the only orebody that has been thoroughly explored in depth is that of Iron Mountain. But these investigations did



Geological Section of Iron Mountain, Showing Position of Sulphide Orebodies.

This can readily be seen in the geological section. To the west there are the great lenses of Iron Mountain covered by an iron hat, from which the copper has all been leached and deposited in the 'basin'; to the east, the Hornet orebody is in its unaltered condition, with little or no gossan, and consequent slight enrichment. The prospects of finding high-grade deposits in this part of the county without an extensive cap of gossan are not good, though this is not the case in the Bully Hill district. The character of these sulphides is similar to that of Rio Tinto, though the occurrence is somewhat different, for the former occur as shallow basins surrounded by rhyolite, and the latter go to unknown depths associated with porphyry and slate.

not lead to any discoveries of importance. That a few narrow zones impregnated with copper and iron occur throughout the mountain may be said to be all the encouragement that the diamond-drills could give, and hence it is improbable that deep mining will be carried on.

At Iron Mountain the orebody itself has not escaped dynamic disturbance, the major line of thrust causing a fault across the middle of the mass, by which the northern end is thrown upward about 60 ft. in a fault-plane having a dip of 70°. This may readily be seen by the clean polished surface on the fault and by the character of the ore on both sides of it. Specimens taken on the same level on either side of the fault differ in appearance and

in their contents of copper, proving that most of the secondary enrichment was prior to this faulting. There are two other families of fissure planes of less importance, which have a bearing on the economic mining of the ore, though they have no marked bearing on the geology of the mass. The Iron Mountain orebody has 6% copper, $1 in gold, about 1½ oz. silver, and 48% sulphur.

The other orebodies are not dissimilar in character, though they have less gossan, and all carry less copper. The Sugar Loaf hill, lying between Iron Mountain and Balakalala, has been prospected for many years with little success as yet, though it is probable that orebodies will be found on the northeast slope.

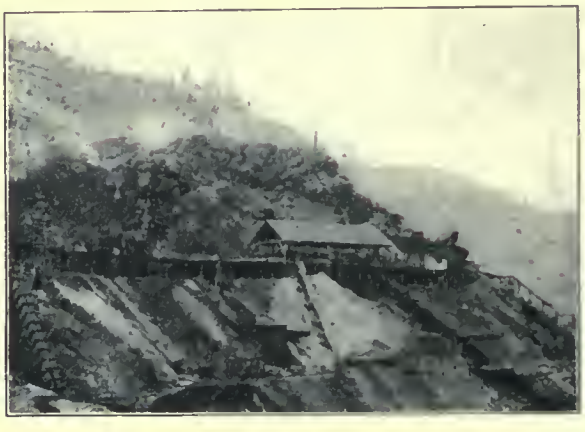
On walking down the steep gulch of Spring creek, full of boulders from the Devonian sedimentaries at its head, the productive rhyolites again form a barrier beyond which the younger camps of Balakalala and Shasta King

Secondary Silicification of the Mineralized and Sheared Zone That Contains the Orebodies of Iron Mountain.

come into sight with the broad expanse of the Stillwater plains beyond.

The landscape changes here from the barren hills of Iron Mountain, sparsely covered with manzanita and scrub or poison oak, to a well-timbered country traversed by steep gulches, under frowning bluffs. Far away at the foot of the bluffs is situated the Shasta King camp, owned by the Trinity Copper Co., while beyond Squaw creek is the Mammoth, which has recently proved itself to be the largest orebody yet discovered. About half way down the mountain, overlooking the Sacramento river, the Balakalala mine is being developed and is proving to be one of the great low-grade mines of the belt. The ore, however, differs from that of Iron Mountain or the Mammoth in containing a higher percentage of silica. The form of the orebody is as yet not fully determined. Within a mile, the Windy Camp group of claims are likely to develop into a valuable mine, in consequence of the vigorous exploration now under way. The Balakalala lode is one of the most prominent in the district. It is heavily capped with gossan and can be traced for more than half a mile. The Windy Camp orebody is possibly on the same lode and has been traced about 1,000 ft. on its strike. The orebodies here are variable in width and the replacement of the country rock has not been complete. Just below Windy Camp are the Shasta King workings. These have outlined an irregular basin several hundred feet wide, united by zones of shearing and fissuring in which there are deposits of sulphide ore of fair grade. The Mammoth mine has certain peculiarities, which have been exposed by recent developments. The ore was followed down and apparently the bottom of a basin reached. It was soon found, however, that the orebody was not merely a shallow basin, but that it extended up the hill as a hook-shaped mass, the shank of which lay sloping up the hill and the point of which was at the outcrop.

The geology of the Bully Hill district is very different and more complex. A series of volcanic rocks, both acidic and basic, form Bully Hill. This is traversed by a number of irregular lines of shearing and mineralization. In these, orebodies occur irregularly distributed in masses of varying extent and richness. The deposits, though smaller and more irregular, often contain more copper and precious metals than those in the western part of the district. Zinc blende, barite, and chalcopyrite are important constituents of the ore in this and the After Thought districts. The development of the old Copper City district and the Winthrop mine is being taken up by the Bully Hill company, and good orebodies are being opened up. Small deposits of oxidized copper ore have been found in the limestone surrounding this district, but hitherto they have not received much attention



Outcrop on Iron Mountain. Steam Issuing From Mine Fire.

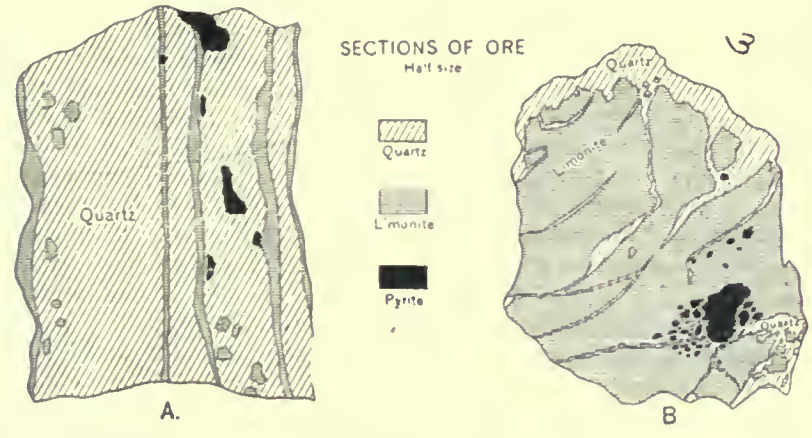
owing to their rough and inaccessible surroundings. The Afterthought mine has an ore that contains large quantities of zinc and barite, which make the ore refractory to smelting. It is possible, however, that these zinky ores may become profitable as a source of that metal. The iron ore deposits at the junction of the McCloud and Pit rivers afford another field for investigation. This district holds out some promise of copper discovery, but the traces of sulphides and pseudomorphs suggest that a pyrrhotite or pentlandite, similar to that of the Sudbury district, may have been the original source of these interesting deposits.

By following the scientific disputes of the past (and indeed no period has been free from these disputes), a kind of personal acquaintance with the character and manner of thought of the writers is involuntarily obtained, along with a practical experience of the problems of science. Two additions to the knowledge of the individual writer are thus obtained. The reader acquires a lively sense of scientific and of personal style; at times he is annoyed by the prolixity and vagueness of one writer, or pleased by the concise clearness of another, and endeavors to attain in his own works that which has been so pleasing in the works of others.

Secondary Changes at Cherry Creek, Arizona.

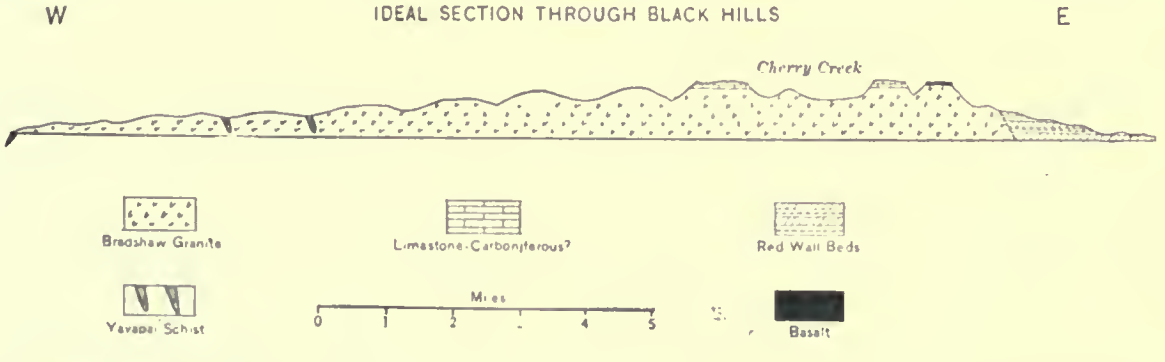
By JOHN A. REID.

*The phenomenon of secondary deposition of minerals in the Cherry Creek district is peculiar and interesting, both from a mining and from a scientific standpoint. The development work in the mines has not yet progressed far enough to exhibit all the changes which have occurred, yet there can be no doubt that the four zones of Emmons[1] are almost ideally developed. Furthermore, the veins already opened show the instability of any one set of geological conditions, for the zone of impoverishment is invading the zone of rich oxides, which in turn is encroaching upon the rich sulphides below. The causes operating to make possible these continued changes are easily found. At least three distinct sets of movements fracturing the vein filling and enclosing dikes have occurred, so that the vadose waters have been free to circulate. The present water-level in the mines is strikingly different from what it must have been in times past, for permanent water is found at about sixty feet, or even less in some mines, below the surface, while the heavy oxidized ore continues downward to unknown depths. A recent wet year is largely responsible for present conditions, but not entirely, for before the rains of 1904–5 the mines were water-bearing in some degree.



The zone of impoverishment, because of the continued leaching it is undergoing, presents several interesting features. As discussed by Emmons,[2] Weed,[3] and others, this surface zone is characterized by low values or lack of values, containing usually nothing but oxides of iron and silica. In Cherry Creek, however, a subzone of further impoverishment exists, from which not only the values have been leached, but also the iron oxides and even silica have been partially or very largely removed. The two factors of age and openness of veins have been chiefly responsible for this. At the surface, quartz, in most veins, outcrops in stringers and larger masses. Such surface quartz is not often prominent, because of the shattering of the material, although hard boulder-like fragments occur, surrounded by softer rock. In a few veins the outcrop is prominent, and is composed of quartz stringers in granite porphyry, the hard mineral restraining the erosion of the whole. Limonite, in stringers and veinlets, cements this broken quartz. The iron oxide frequently appears as pseudomorphs after pyrite, the form of the pyritohedron being very common. The main direction of breaking is parallel to the plane of the veins, hence the larger veinlets of limonite are more or less parallel, giving a rough effect of ribbon structure (see A in Fig. 2). Below the outcrop a few feet the quartz and contained limonite decrease in abundance, frequently disappearing entirely. Assay values showed the same, returns from the surface being notably higher in the majority of cases than five or ten feet lower down. Furthermore, in the instances where the quartz has only partly gone, the iron oxide has almost entirely been carried below, taking with it the gold values. In one of the larger east-west veins, the upper seventy-five feet has been thus leached of all but a trace, while below that depth good ore exists in quantity.

After the barren, or nearly barren, portion of the veins has been passed through, heavy rich limonite in quartz is encountered. The aphanitic texture is always prominent, and small shiny areas of unaltered pyrite are frequently present in the midst of the heaviest iron oxide (see B in Fig. 2). Secondary quartz, at times jaspery, is noticeable in this portion of the veins, and occurs both in irregular patches and in small veinlets in the limonite. The heavier the oxide, the larger the amount of secondary silica. At the Golden Idol mine, in which the vein material is about 90% iron oxide, the limonite extends to the surface. The outcrop is eighteen inches wide, assaying a low value; forty feet down the vein is five feet wide, of almost solid rich limonite, with a very rich ten-inch streak in the centre. The centre streak is well defined and clearly a deposit later than the enclosing material. In the bottom of the workings rich sulphide ore is commencing to show, below the present water-level. In the phenomenon of the veins being narrowest at, or just below, the outcrop, it is to be noted that the walls in the narrowest portions show evidence of lateral pressure and crushing, attendant upon the removal of material from between them.



At present writing the zone of secondary sulphides has been merely touched, only residual fragments of these minerals having been extracted. Their occurrence, however, demonstrates two facts: First, the actual presence of a zone of secondary sulphide enrichment; and, second, the gradual migration of this zone downward. The sulphides found are extremely heavy, and constitute

*Abstract of paper entitled 'Sketch of the Geology and Ore Deposits of the Cherry Creek District, Arizona,' by John A. Reid. *Economic Geology*. Vol. I, No. 5.

[1] S. F. Emmons, 'Secondary Enrichment of Ore Deposits,' *Trans.* A. I. M. E., Feb. 1900.

[2] S. F. Emmons, *Trans.* A. I. M. E., Feb., 1900, pp. 463–461.

[3] W. H. Weed, 'Enrichment of Silver Veins,' *Trans.* A. I. M. E., Feb., 1900, p. 476.

some of the very richest ore. In the western veins, copper sulphides have been found only in small amount; on the eastern slope, chalcopyrite and bornite are found in increasing amount with depth. Not the most minute traces of oxidized copper minerals have been seen in any part of the district. At the Pfau mine, situated in the large dike on the east slope of the Black Hills the ore is apparently very thoroughly oxidized, yet a search in material from the lower levels will be rewarded by lumps of copper iron sulphides, often eight inches in diameter, covered with a half inch shell of earthy limonite. Chalcopyrite is in larger amount than the bornite. Pyrite occurs in the higher portions, just as in the western veins.

The peculiarity, then, of the secondary deposition of minerals is evident. The zone of oxide enrichment contains limonite and quartz, with free gold, and no traces of copper. The small amounts of sulphides and pyrite toward the surface, changing into copper minerals below, these latter minerals being best developed in the eastern veins. Further, the double sulphides of iron and copper are found exclusively, no chalcocite or covellite being present. What may be below is extremely problematical, but it would not be surprising if the simple sulphides are there in abundance. It is worthy of note in this connection that the United Verde mine at Jerome was worked solely as a gold mine in the early stages of its history, and had a precarious existence until the rich copper ores were struck in depth.

In the typical copper vein the oxidized zones contain copper minerals, often in great abundance, and outcropping on the surface, as at Globe, Bisbee, and Clifton, in southern Arizona. At Cherry Creek and Jerome, such oxidized copper ores are conspicuously absent, while the surface zone is wholly or partly leached, not only of its values, but also of its gangue. The conditions causing such a result are of two kinds: Structural and chemical. The structural conditions are those of movements in the veins, shattering the country rock as well as the vein stone, thereby opening well the ores to surface agencies. The chemical conditions are, in their nature, more obscure, and can only be surmised at this writing. Azurite, malachite, cuprite, and crysocolla, are stable under the common conditions found in the oxidized zones in copper veins, so that their complete absence proves the existence of a situation chemically somewhat unusual. Also, the peculiar effects noted in the veins at and just below the surface call for explanation. The most notable characteristics of the veins are: (1) The abundance of limonite; and (2) the prevalence of a gneissic or schistose structure accompanying the veins and the bleaching of the rocks by the action of sulphuric acid. At times the action of the acid has proceeded sufficiently far to produce from the rock a white pulverulent mass. This intense action is always found in the very summits of the veins just below the outcrop.

The first striking feature, the quartz outcrop followed below by a vein filling poor in constituents of foreign source, can be easily explained. The active solutions start from the surface, enter the vein, and because their power is least at the start, and because fresh oxygen-bearing water follows, the actual outcrop is comparatively little attacked. On the other hand, the solutions passing through the first foot or two of surface vein filling, and taking up the acid found therein, are held in contact for some time with that portion and their leaching action becomes intense. The deposition of the material thus taken into solution necessarily follows as the waters percolate downward.

Secondly, with an abundance of iron and sulphuric acid, and with the free access of oxygen, the secondary copper minerals, so commonly found in the upper portions of veins, could not form. The cupric sulphate, produced both by the free acid and the ferric sulphate, would be carried down to the bottom of the zone of oxidation. Under these conditions the gold would also be leached from the surface and deposited on the oxidation of the iron salts to hydrate. Silica would also be deposited as the character of the solutions change. Rickard,[1] in his valuable paper, has presented the main facts regarding the enrichment of gold veins, although he leaves rather in abeyance the fact that sometimes gold migrates and at other times it does not. The migration in the Cherry Creek district is no doubt chiefly caused by the very large amounts of ferric sulphate present, aided possibly by chlorides from the overlying limestone. It is not clear exactly what solvents are responsible for the downward movement of the silica. That silica does so move is well known; witness the frequent sintery quartz of vein outcrops. Also, at the Comstock lode, the vadose waters, containing 11% of soluble sulphates and 12½% of free sulphuric acid, hold in solution 0.55% of silica. Simple equations expressing graphically the relations outlined above, could be written, but it seems inadvisable to do so until our precise knowledge is greater.

A further point is this: Among secondary sulphides present, those bearing copper are invariably the double salts of copper and iron, with chalcopyrite in larger amount. The reasons for this may also lie in the excess of iron and sulphuric acid present in the vein. The presence of sulphuric acid necessitates a plentiful supply of oxygen, which is not at all at variance with the facts of vein shattering. If equations be written expressing the probable reactions producing the minerals chalcopyrite, bornite, and chalcocite, or better, general equations summing up all intermediate reactions, it will be found that, in the main, chalcocite will form when the ratio of the copper to the iron is as 2:1; bornite when this ratio is 3:2, or, when both iron and a strong agent are in excess, 3:1 chalropyrite when this ratio is 2:3, or, when a strong reducing agent is present, 1:1. As the veins have been well opened to oxidizing solutions, in the upper portions of the veins strong reducing agents were lacking. In this case, the ratios of copper to iron for chalcocite, bornite, and chalcopyrite are 2:1, 3:2, and 2:3, respectively. Thus, the excess of ferric salts and lack of strong reducing agents would favor the formation of double sulphides. It is needless to state that the whole subject of the physical chemistry of this comparatively simple process of secondary enrichment of copper ores, is in need of thorough experimental treatment before we shall be in a position rightly to interpret the facts. The working geologist lacks time and often the requisite knowledge for pursuing such investigation, and must, perforce, depend upon the labors of others. At Cherry Creek, however, the facts in the field, such as the great abundance of limonite with frequent kernels of pyrite the vein shattering, and the bleaching action of sulphuric acid, appear to warrant the tentative conclusion above set forth.

With depth, it is almost beyond doubt that the gold values will decrease while the copper will increase in amount. At what depth a pronounced change will be found it is not possible to say. The deepest mine workings show ore thoroughly oxidized, with the exception of a few residual sulphide masses, and practically of the same chemical nature throughout. The ground water now being well above the bottom of the zone of oxide enrichment offers no criterion, but proves only the existence of a more arid past. The gold values will continue through the zone of oxidation and into the underlying

[1] T. A. Rickard, "The Formation of Bonanzas in the Upper Portions of Gold Veins," *Trans.* A.I.M.E., Feb., 1901.

zone of secondary sulphides, and there should be considerable depth to the gold-bearing minerals. If the above ideas regarding the genesis of the double sulphides be correct, it is possible that chalcosite may be found with greater depth, formed after much of the iron has been left behind as limonite. In any case, there should be an abundant supply of good ore, both with gold value and with copper as the chief metal.

Estimate of Supplies Needed to Run a 10-Stamp Mill for One Month.

(1) 10 gal. engine-oil. Lubricants of all kinds are generally wasted by ignorant or careless employees so that a liberal quantity is here provided.

(2) 10 gal. cylinder-oil. With care and the use of sight-feed lubricators, a much less quantity should do.

(3) 50 gal. coal-oil for lighting. This will vary with the season, the latitude, and the number of lanterns used.

(4) 25 lb. soft cup-grease. For rock-breaker and for the shaft bearings.

(5) 6 one-pound boxes of axle grease. For cams. When properly applied it gives a coating which thereafter needs but a touch of grease.

(6) 1 box of candles. About 6 candles will be consumed per night. This item may be omitted where incandescent electric lights have been properly installed.

(7) 50 lb. cotton waste. After this has been used by the engineer, it should be washed and used for wiping the shafting and the rock-breaker.

(8) 10 lb. assorted packing for engine, valves, etc. The kind of packing will depend on the engine, and should be enough to repack stuffing boxes and valves monthly.

(9) 1 sq. yd. of 1/16-in. sheet rubber. This is needed for gaskets for screens and joints.

(10) A half-pint each of sulphuric and nitric acid. This is useful to dissolve out cast iron, copper, etc., from the residuum at a clean-up where the gold or amalgam is cleaned from impurities.

(11) Five pounds each of potassium cyanide and of concentrated lye. Cyanide of potassium is useful when coating the plates with mercury, or to clean them when they become discolored from arsenic, sulphur, etc., in the ore. The concentrated lye is useful to remove grease from the plates where it has, through any carelessness, gotten on them.

(12) One ounce of metallic sodium. This is used for cleaning the mercury after retorting.

(13) Four ounces of prepared amalgam. To use on the plates at first starting a mill; if this runs continuously it is not again needed.

(14) Three flasks mercury (75 lb. per flask). For amalgamating the plates and feeding to the batteries.

(15) Half a dozen whisk brooms. For brushing the plates. These brooms should be cut to half their usual length so as to give a good stiff brush.

(16) One fine sponge. (For taking sand, etc., from the surface of amalgam or mercury).

(17) One yard of 8 oz. cotton duck. For straining the amalgam.

(18) Two putty knives. For use on the plates for scraping up the amalgam.

(19) One Wedgewood mortar and pestle 10 in. diam. For grinding small lots of amalgam.

The approximate cost of above supplies is $250.

CAPITAL competes with capital, labor with labor; but capital cannot compete with labor any more than labor can compete with capital. Competition can only exist between factors of the same order.

Overfire in Copper-Matting Blast-Furnace Smelting Practice.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

Anyone accustomed to the quiet running of a silver-lead blast-furnace, with its reducing atmosphere and its cool top, is worried by the way a copper blast-furnace is operated, with its abundant overfire, pyrotechnic shooting up of pieces of ore, oxidizing blast effects, and highly heated escaping gases often (just before putting in a fresh charge) of the temperature of 900° F. (485° C.) He knows that for the best and most economical running of his furnace, it should have the proverbial cold head and warm feet of the healthy man; that is, the surfaces of the charge should be cool, having no visible heat or flame coming up through it, and there should be the intensest combustion of the fuel at the tuyeres, since one thus obtains a hot well-melted slag, with fusion and reduction well completed.

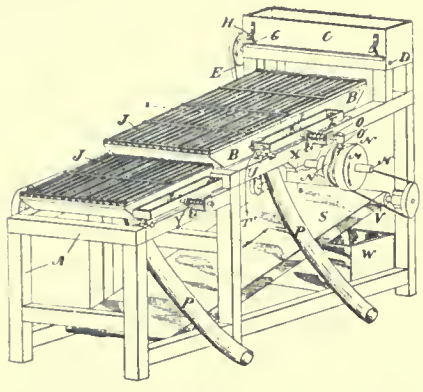
For all this we find, even in the case of those metallurgists who have been accustomed to silver-lead practice, that they are willing to submit to abundant overfire in their copper blast-furnaces under plea that they get (as they do) good results from so doing. Were a silver-lead blast-furnace to be run in this way the lead of the charge would be volatilized, passing off with the escaping gases, but copper, being a comparatively non-volatile metal, is not lost to any extent; though, in oxidized copper ore smelting, and in the smelting of copper-bearing slag in the copper region of Lake Superior, one may notice that there is some such loss, as is evinced by the blue color of the rising flame. But, even granting that there is but little loss for this reason, there remains the fact that much heat is uselessly escaping that should be utilized at the tuyeres where it is needed to keep the tuyere zone hot. Two things would contribute to this. First, feeding and operating the furnace so as to keep down overfire as much as possible, and second, diminishing the fuel, while at the same time heating the blast. As regards the first factor, much more can be done than is generally accomplished by packing the charge, keeping the shaft clear and free from accumulations, feeding large charges properly segregated, keeping the tuyeres open, and feeding fuel to come down in front of them. As regards the second factor, hot or even warm blast has been found to greatly assist in increasing heat at the tuyere zone, and thus bringing the furnace into the best condition. I have seen copper matting furnaces (especially those devoted to the smelting of roasted leady copper matte), run with but little overfire—certainly without the excessive heat to be observed in the operation of so many of those that are ordinarily run. I am of the opinion that such conditions need not necessarily exist, and that they can be improved to a greater or less degree. I would like an expression of opinion, and especially a statement of what has been accomplished by smelting men in this way.

A PATENT issued to a railroad company is presumptive evidence that the land was at its date non-mineral. It is not open to collateral attack any more than an agricultural patent would be. If, at the date of the issuance of the patent, there was upon the ground an actively and profitably worked mine, the aid of the Government might possibly be secured to vacate the patent at the instigation of the mine owner or his successor in estate. No locator, however, not connecting himself with a valid mineral right subsisting at the time the patent issued would have any standing whatever in court, and could not assail the railroad title. This, of course, includes one who has located the ground since the railroad patent was issued.

MINING AND METALLURGICAL PATENTS.

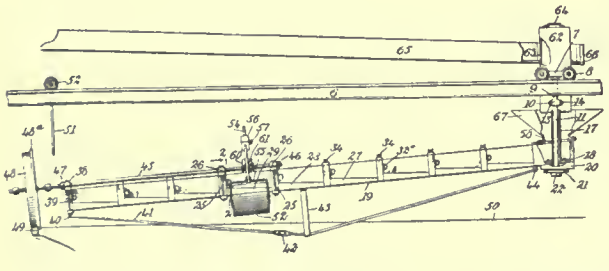
Specially Reported for the MINING AND SCIENTIFIC PRESS.

CONCENTRATOR.—No. 838,468; John P. Shumway, Los Angeles, California.



The herein-described apparatus for separating ore without the use of water, comprising a plurality of concentrator-tables pivotally mounted in a supporting frame and arranged to normally have an inclination downward from the head to the foot thereof, one table being mounted higher than the other and arranged to discharge the waste from the first or highest table onto the table next below the same; an air-tight casing beneath the canvas top of the table, a canvas or covering thereon and means to vibrate said covering; means to supply air to the air-chamber below the covering; and means substantially as shown to impart a vibratory motion to said table in combination with a carrying belt disposed below the concentrator-table and adapted to receive the contents of the table when the tables are thrown into the vertical position, the said carrying-belt extending under all the concentrator-tables and being operatively connected with the main driving-shaft and arranged to carry the material dumped thereon into a receptacle and means to feed the tables with the substance to be operated on.

PULP-DISTRIBUTER.—No. 838,196; David Lonie, Fairview, British Columbia, Canada, assignor of one-half to Henry Lee, Fairview, Canada.

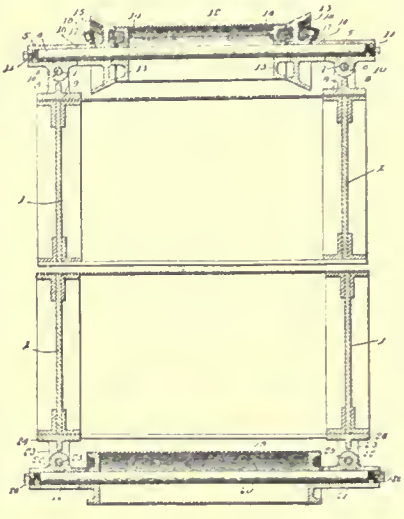


In a pulp-distributer, the combination of a chute, means for rendering the same movable upon a centre, a revoluble shaft connected with said chute and provided with a revoluble member, a track for supporting said revoluble member, a pan mounted upon said chute and adapted to be filled, and mechanism connecting said pan with said revoluble member for the purpose of moving said chute.

STAMP-MILL.—No. 838,190; Peter Kirkegaard, Deloro, Ontario, Canada.

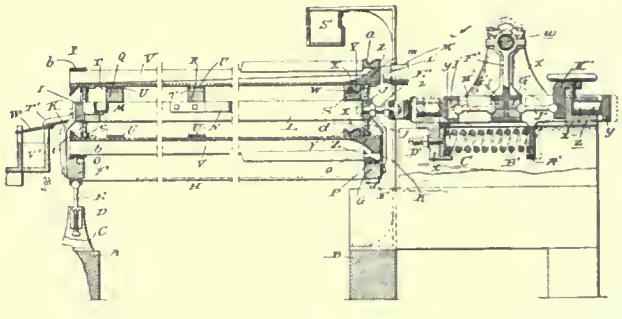
A means for hanging up the stamps of stamp-mills, comprising a tube or sleeve, hinged at a fixed point on the stamp-mill and arranged to swing into the path of the tappet thereof, a rod telescoping therein and having a roller within the sleeve, a cam pivoted within the sleeve and acting through the wall thereof on said roller, and a handle whereby the sleeve is initially located beneath the tappet and the rod subsequently projected therefrom by the cam so as to lift the tappet into inoperative relation.

CONVEYOR.—No. 838,119; George W. King, Marion, Ohio, assignor to the Marion Steam Shovel Company of Marion, Ohio, a Corporation of Ohio.



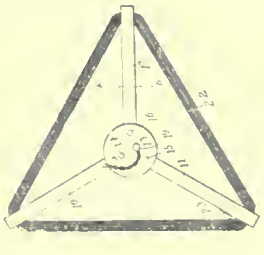
In a belt conveyor of the character described the combination with a stacker-frame, of belt-supporting rollers, rotating shafts on which said rollers are mounted, and end-supporting bearings for said shafts, each bearing comprising a bearing sleeve to receive the shaft and a base or bracket secured to the frame, said sleeve and base being connected by a pivot transverse to the shaft, substantially as described.

ORE-CONCENTRATING TABLE.—No. 838,058; Frederic W. Sherman, Park City, Utah.



In an apparatus for treating pulp, slimes and the like, the combination of a receptacle for receiving the material; means for imparting a reciprocating movement thereto; means independent of the reciprocating means for abruptly stopping the movement of the receptacle in one direction; and means for imparting to the receptacle as it is moved in the opposite direction a jar or impact in a plane approximately vertical to the longitudinal axis of the receptacle.

SURVEYOR'S REEL.—No. 837,931; Edward H. Holden, New York, New York.



A reel composed of a pair of disks, an arm immovably secured thereto; a pair of additional arms pivoted to the disks, means for limiting the movement of the pivoted arms, and means for locking said arms, substantially as specified.

The Deister Concentrator at the Baltic Mill.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

The Baltic mill, at Redridge, Michigan, recovers native copper from an ore containing about one per cent of the metal. The copper is in part finely knit or disseminated through the rock, so that to recover this, fine crushing is needed. Now, to work such slimed material, a minimum supply of wash-water and an opportunity for the quiet settling of the heavy particles are needed. This

The Deister Concentrator.

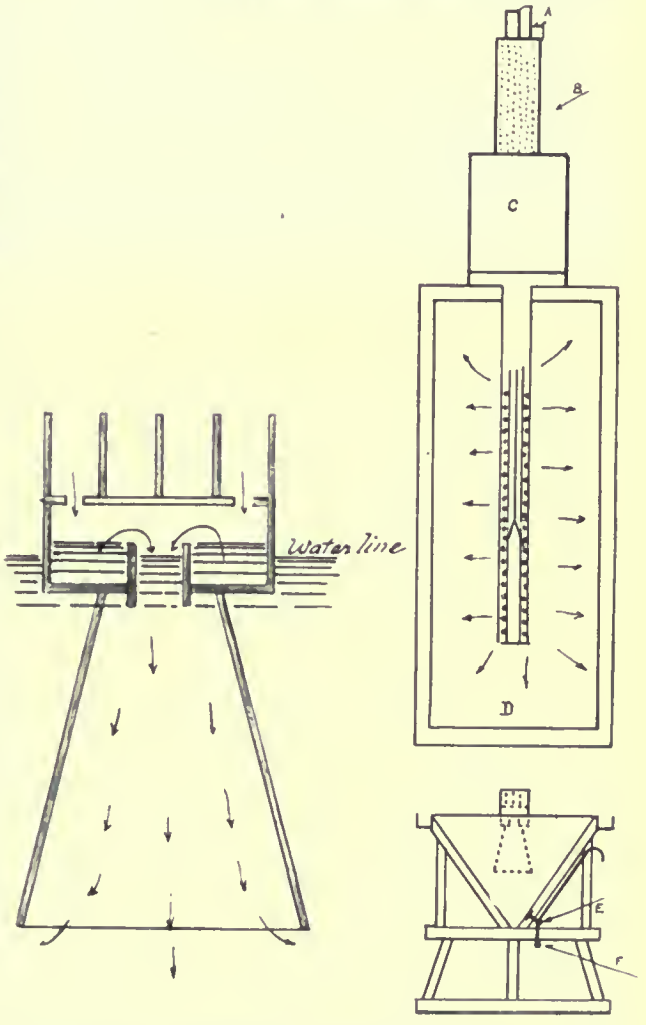
the Deister people claim they have attained in their machine to a greater extent than in any other similar table-concentrator. With the same stated capacity, the table has but half the area of its competitors, and is operated at the high speed of 320 revolutions, or 640 strokes per minute, but with the consumption of one-fifth of a horse-power only. Because of its smaller dimensions one notices but little of that vertical vibration which tends to throw the surface of the water-sheet into transverse ripples. One may say that the longer table has a nodal zone of vibration, and here there is less chance for quiet settling as compared with the smaller table. Again, the Deister table has three higher riffles or strips, serving to make a quiet pool or pocket where the heavier ore particles are brought to rest and travel along, sheltered by the riffle, to the point of discharge.

When the Deister table was first introduced in an experimental way at the Baltic mill, tests were made with it as against the Overstrom table, and with the same feed, as well as the same tonnage put through. The tests were so satisfactory for the smaller table that it was decided to put in a complete set of ten of them to take care of the discharge from a single stamp. This was classified by a new design of settling-box or classifier, which delivered two classes of stuff, the coarser going to four tables and the finer to six others, thus giving better classified material than that of an ordinary settling-tank as heretofore used. This settling-box may be described as follows: The launder, taking the overflow of the Tamarack classifier and from which the jig stuff had been removed, delivers to a screen box 3 by 8 ft. having a false bottom pierced with 3/16-in. holes, which removes chips and small pieces of wood. The pulp passes to a V-bottomed settling-box 6 by 8 ft. area, where the coarser pulp is taken out at four gooseneck spigot-discharges to four of the Deister tables. The overflow of the small settler is distributed evenly to the large V-bottomed settling-box having a projected area of 11 by 28 ft. Six Deister tables take the six gooseneck spigot-discharges from this box. The overflow is upon three sides of the box, equal to 68 linear feet in all, and still carries some 60 tons of dry material in 24 hours. The surface of the liquid in the box appears to be quite quiet. In spite of such careful settling it is possible to pan out and find copper in the heavier portions of the overflow which now runs to waste. The gooseneck discharge pipes, already referred to, rise from the lower part of the settling-box or tank to a height such that a flow is still ensured. The use af them has the effect of giving a thicker product than if one used the direct spigot-discharge.

A series of comparative tests were made between the Overstrom and the Deister tables, the former, however, taking its supply of an unclassified and coarser stuff from a small settling-tank of the ordinary design, while the Deister obtained a more uniform product from the large settling-box above described. The results were for the average percentage of extraction:

	Mineral alone.	Mineral and middling.
Overstrom	53.1%	65.2%
Deister	56.6 "	68.8 "

Upon panning the tailing from each table the writer found, as far as could be judged by eye, that the tailing of the Deister contained but one-third as much metallic copper (in flaky form) as the larger table, showing the superiority of the new table in the separation of this kind of material. The ore, besides native copper, con-



A, Launders. *B*, Screen-box for removal of chips. *C*, Primary V tank, 7 by 8 ft. by 5 ft. deep, and overflow. Coarse slime from this tank goes to three tables.
D, Secondary V-tank, 12 by 30 ft. by 8 ft. deep. Circumferential overflow. Fine slime from this tank goes to six tables.
E, Three-way cock, with 1¼-in. pipe, fitted with goose-neck having hydraulic connection.
F, Three of these on small tank and six of them on the large one.

Sketch Showing Method of Distributing Slime in Large Rectangular V-Tank. Contributed by F. G. Coggin.

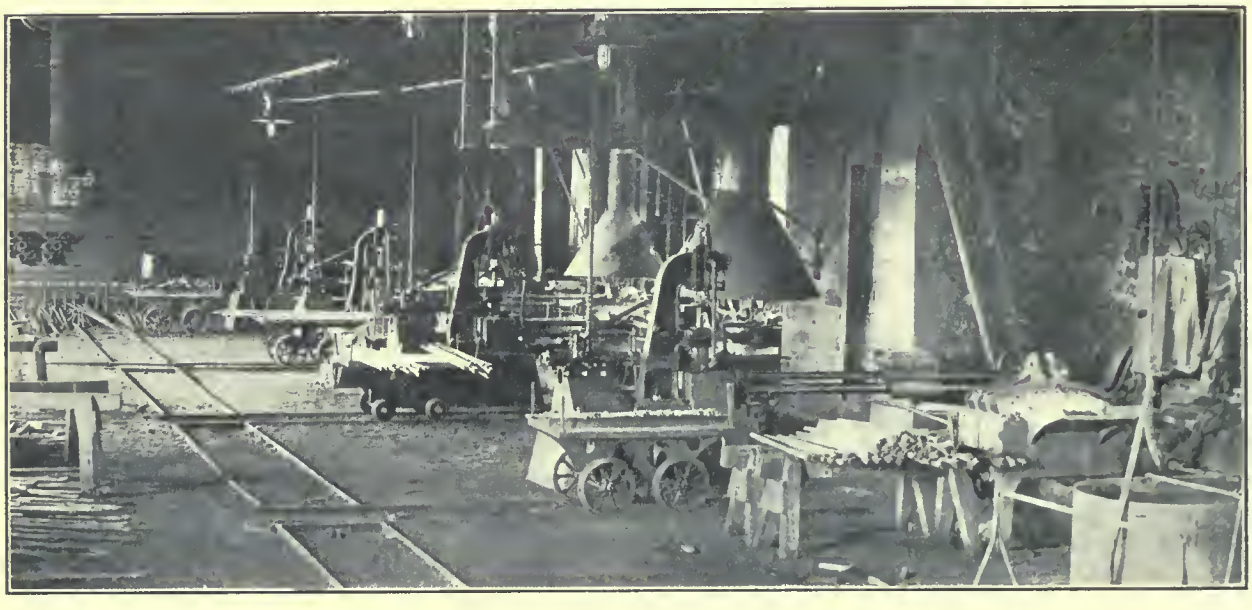
tains chalcocite, and it is this latter mineral that has probably been as well separated on one table as on the other.

It is intended to put an Overstrom table in use on the classified stuff of the new settling-box for the purpose of comparing it directly with the smaller table, and until this is done final judgment must be reserved.

In this experiment the personal equation comes in, men doing better work upon the table to which they are most accustomed or which happens to suit their particular characteristics.

A Modern Drill Shop.

An interesting feature of the Quincy Mining Co.'s plant at Hancock, Mich., is their drill-shop equipment, illustrated in the accompanying engraving. The shop, which is 40 by 80 ft., contains four drill-sharpening machines of the Word Bros. type; two of them are used to sharpen the chisel-bit drills and the other two handle the cruciform steel. A large steel tank, partly shown at the right, is used for tempering the steel. A car-track running lengthwise with the shop and four turntables, with short tracks leading therefrom, enables the attendant to keep the dulled drills up to the machines and to take the finished drills to the tempering tank without interrupting the operators of the sharpening machines. Special coke furnaces are used for heating the steel. New drills are forged almost as rapidly as old ones are sharpened. With four men to operate the machines and one man to attend to the tempering and distributing, an average of 2,500 drills per day are handled in this shop.



A Modern Drill Shop.

Commercial Paragraphs.

THE SEASHORE REALTY CO., of Long Beach, Cal., has opened a free reading room for mining men and has the leading mining papers on file.

THE H. W. JOHNS-MANVILLE CO., of New York, will open a New Orleans branch on January 1. This will consist of a large retail store, offices and warerooms, situated in a three-story building at the corner of Baronne and Perdido streets.

JOS. RETALLACK, 1701 Blake St. Denver, manufacturer of the new Eclipse Drill Maker and Sharpener has ten of his machines in operation at the large mines of the Cripple Creek district; also has a number in Montana, Arizona, and Mexico. The manufacturer claims this machine will make drills complete with round, square, hexagon, or octagon shank from the steel bar without any hand work whatever. Any form of bit, cross, X, Y, or chisel point formed with accuracy in one heat. He also manufactures an automatic tempering machine for use in connection with the drill-sharpener.

A New Gold Saving Machine.

The problem of saving fine and flaky gold, either in placer gravel or mill pulp has, to a large extent, been solved by the Schutz Separator, a new machine now being put on the market by the Schutz Separator Co., of 939 Oak St., San Francisco. The machine is compact and has large capacity. The material to be treated is conveyed into a revolving hopper, which distributes the load evenly within an inner shell over revolving flexible flat steel brushes confined within that inner shell, which is 12 in. less in diameter than the main tank. There are two sets of revolving brushes, each set containing 12 arms and having 10 brushes to each arm. These sets of arms are fastened on a main revolving hollow shaft, one above the other, at an interval of 12 in. The brushes are fastened on these arms so as to interlock and move in opposite directions. All material to be concentrated must pass through this system of brushes, and thus every particle of gold is thoroughly separated and cleaned. The inner shell extends about eight inches above the main tank to prevent any material from flowing direct from the revolving hopper over the main tank into the waste sluice; while the lower edge of the inner shell extends to within eight inches of the bottom of main tank. The pulp, in its downward course, comes in contact with the revolving pipes, ejecting water from its perforated holes, separating and precipitating the gold, while the lighter and baser material escapes from under the inner shell and is forced upward over the main water tank into a circular sluice to the waste dump. These revolving water-pipes are fed from the hollow shaft in the centre of machine. There are 32 of them, and they extend from the centre receiver like the spokes of a wagon wheel, although connected to a circular rim. They are perforated with two rows of small holes. One row of holes is on the bottom of the pipe, the other on top. The bottom slopes outward so as to assist the concentrate to gravitate to the outer edge. The concentrate escapes from the main tank through suitable openings in the bottom.

A small particle of gold, thoroughly scoured and cleaned, has greater specific gravity according to its bulk than any other mineral, and will sink against the force of water applied from these revolving pipes, while the light and bulkier material — usually of no value — will be forced upward into the waste sluice. The amount of water required to operate this separator is half of a miner's inch to every square foot of area, while every corresponding square foot of area will separate and concentrate 500 lb. sand per hour. The necessary fall of water will not exceed 20 ft. vertical. The machine has been in practical use for three years; it is made in three different sizes, namely, 6 ft., 8 ft., and 10 ft. diameter. One of the 6-ft. diam. Separators is now on exhibition at 1371 Harrison St., San Francisco.

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Editorial.

A CORRESPONDENT who is thoroughly familiar with the coal business of the Middle West contributes, in this issue, a useful article on the shortage of cars and the cause of it. One remark is particularly worth emphasizing, and that is the reference to the time devoted to the ticker on the part of traffic managers. This is too large a subject for a paragraph, but we may note that the biggest railroad operator in the country was once a Wall Street broker, and does not disdain even now to juggle with a declaration of dividends so as to make a neat little clean-up for himself and his associates.

WE CONGRATULATE Mr. Lewis E. Aubury on his re-appointment as State Mineralogist. It does scant justice to him and puts Governor Pardee in a poor light. After hesitating for two years, the Governor makes the appointment just at the moment when his power is about to be transferred to another executive. During the interval the Mining Bureau has suffered by having a chief whose tenure of office was uncertain. This is an example of the play of small politics on appointments that should be wholly divorced from political considerations. The office of State Mineralogist should be treated as one coming under the civil service rules, and a man who performs the duties of it faithfully should have the first claim to succeed himself. We believe that Mr. Aubury has served the State faithfully, and we record his re-appointment with pleasure.

WE TAKE PLEASURE in publishing a letter from Mr. Charles G. Yale, commenting upon some recent remarks appearing in these columns. No one is so well qualified as Mr. Yale to speak on mining matters in California or to discuss the status of the Miners Association. It appears that the term 'coterie' gave umbrage, but reference to any dictionary will show that it is in no sense disparaging, for it means a group of persons who meet together for social or scientific purposes. Certainly no offense was meant. The incident illustrates anew the danger of departing from the use of good straight English, and for this lapse we apologise. It is unfortunate that interest in the Association has been so slight during the last two or three years that its affairs have had to be managed by the same group of men, to whose public spirit the organization owes its survival. Without being destructively critical, we venture to say that this decrease of interest was inevitable in the face of the decline in hydraulic mining and the lack of real progress in the efforts to solve the debris problem. Mr. Yale's figures are eloquent in this regard, and we join with him also in hoping that the scope of the Association may be enlarged so as to make it truly worthy of its comprehensive title. The new president, Mr. William C. Ralston, is an enc

getic and capable mining engineer and he should be able to enlist active support in giving effect to a broader policy. We look to better days for the California Miners Association.

On another page we give a letter from Mr. James W. Abbott, a mining engineer of proved experience, describing the new camp of Greenwater as he saw it. No locality has been used so recklessly for irresponsible mine promotions, the latest being a two-million dollar incorporation offering shares at half-price on the slender evidence of a lot of windy talk. Mr. Abbott may be severe in his judgment, but he is without prejudice. From other sources we learn that sulphide ore has been found in some of the shafts and that one or two companies are doing systematic exploratory work, so that trustworthy evidence should soon be forthcoming. The large outcrops mentioned in the daily press are, as Mr. Abbott clearly describes them, zones of fracturing, stained with copper and iron minerals; in these, ore containing 10 per cent of copper has been found in places, but continuity is yet to be proved. Owing to the practice of sinking vertical shafts instead of following the ore on the dip of the lode, there is a delay in exposing the nature of the deposit; it may be debated whether it is better mining to sink on the ore or leave it on one side in order to put down a vertical shaft, but the fact remains that the more dilatory tactics are extremely convenient to promoters who are afraid of being handicapped by too many facts.

Writers in mining papers occasionally do a wrong thing, without perhaps realizing it, in citing geologists as authority for their own statements on the science of ore deposition. From a recent news-letter we quote the following: "The presence of chrysocolla and fluorite in the east-west cross-course veins in this district is proof positive of great depth and strength, for invariably the ledges widen as they go down. Another strong argument in favor of ledges of this character is that according to the opinion of the best geologists in this country, notably J. E. Spurr, in his report on the 'Geology of the Tonopah District,' they invariably achieve a depth at least as great as the payable outcrop on the surface. Van Hise and Kemp also agree on this theory." In behalf of Messrs. Spurr, Van Hise, and Kemp we can say that no one of these careful observers and thoughtful writers ever said anything of the kind. It is a gross injustice to a scientific man to impute to him a theory for which he is in no way responsible.

Professors at universities all over the country have been pestered with the circulars, letters, and prospectuses of a Colorado marble company promoted by a syndicate in New York. The methods adopted afford an example of a pestilent misuse of the mail service and illustrate the colossal guile of the modern promoter. The marble deposits are stated to be worth $2,800,000,000, from which, after deducting the costs of extraction, a profit of $1,400,000 is to be obtained. Yet all that is offered is a bond issue to the extent of $500,000. As a matter of fact, this marble was not deemed suitable either for the Denver Public Library or the new Episcopal cathedral, because it is so fractured that large pieces of stone are difficult to get. Incidentally, as illustrating how conventions are used nowadays for advertising purposes, it may be mentioned that the chief promoter of this questionable enterprise delivered a speech before the Colorado Commercial Organization, employing the opportunity to parade his scheme and to print his speech for subsequent dissemination among the professors and other people of supposedly simple financial experience.

The London Mining Market in 1906.

Last week we reviewed the manifestations of speculative mining activity in America during the past year; this week we turn to London, which is still a dominating factor in the finance of world-wide mining operations.

The speculation in gold mining on the Rand was practically dead during 1906; but there has been an excited market in diamond shares, due to the great success of the Premier mine and the discoveries made by the New Vaal River Company; there was also some business in Tanganyika copper and in Rhodesia Broken Hill, two stocks representing large enterprises in northern Rhodesia and across the border into the Congo Free State. The Kaffir market, that is, the one devoted to Rand gold mines, has been on the verge of collapse several times, the general trend being steadily downward with but small dealings. The public has abandoned speculation in these shares, which are held mainly by financial houses that are compelled to protect their holdings from further decline. New capital for development or increase of plant is difficult to obtain because political conditions in the Transvaal are once more on the boil, with the utmost uncertainty as to what party or combination of parties will control the situation. In the meanwhile the Chinese labor problem has continued to be an issue in British politics and certain revelations as to the morality of the coolies, together with emphatic assertions by competent men that white labor can be employed economically, have swung sympathy toward the anti-Chinese party to such an extent as to make complete repatriation a possibility. All this has disgusted the mining magnates and intimidated speculators.

The most picturesque feature of mining speculation at London has been the revival of Cornish mining. This, of course, is the direct result of the rise in the price of tin, which reached a maximum of £215 per ton or 46 cents per pound during the year. Appeals to the patriotism of the British investor and to the romantic story of mining in the 'old county' have been successful, with a strong tin market, in raising capital for a large number of ventures, most of which are based on abandoned mines with a past record. Rich ore in the bottom workings of Dolcoath and dividends from four or five mining companies that were almost moribund a couple of years ago have given encouragement to promoters, so that money has been readily obtainable. In Ireland also there has been something of a flutter, but in copper mining. Naturally, the high price of this metal also has provoked speculation and has justified the issue of several

new undertakings. Of these Great Cobar in New South Wales was the most important; other Australian copper mines were placed in London, together with the Penn-Wyoming mines in Wyoming. Rio Tinto shares have reflected the tone of the copper market and formed a lively medium of speculation on a large scale. Several Siberian copper companies floated in previous years were able to command public favor by their cheerful reports and led the way for further promotions and some tall boosting of quotations. In another metal, zinc, business was done through the medium of Broken Hill shares, smelting companies, and concentrating processes, all of which was the result of a recognition of the value of the big dumps at Broken Hill and the possibility of their profitable beneficiation by new methods.

In Mexican shares the market has been rather quiet. The mines at El Oro reported good progress; Esperanza receded from its high price, there being a lack of confidence in the future of this great mine; El Oro made a discovery in the lower levels, and this stiffened the market, while Mexico stock has reflected satisfactory developments in depth. Near the close of the year there was a spurt in San Francisco del Oro, on telegraphic news of a big discovery. Dolores has been steady, with a recent relapse due to the confession of inadequate working capital.

In American mines, Camp Bird shares dropped when the mill was destroyed in March, but recovered to their former price on re-building and the re-commencement of milling operations at the end of the year. Oroville Dredging has been steady, at about par; Stratton's Independence has had the benefit of some discoveries of ore and of schemes to treat the dump, but shares have continued to decline. Tomboy has made a good showing for the year and declared a good dividend, so that the price advanced. In Canadian mines, the former interest in British Columbian ventures is slight indeed as compared to the days of Whitaker Wright, but there have been dealings in Le Roi, both No. 1 and No. 2; while the price of Ymir has slowly dwindled. A Cobalt flotation drew attention to the new camp in Ontario, but the business done was not important.

Dealings in Indian mines are also confined to a small portion of the British public; the yield of gold is declining, because the best mines have passed the zenith of their development, but dividends are steady, and these shares have proved an eminently satisfactory source of income to the holders of them. The West Australian market, like the Kaffir department, has lost its former animation. Mining is proceeding satisfactorily, but with a recognition of the fact that many of the big mines have reached their maximum development. New ventures are few and unimportant. The general public has lost interest in Westralian shares, dealings being confined to a few well-informed people at Adelaide and at London. But there has been no collapse, the market has remained steady; the only big drop was in Great Fingall and the only big rise was in Kalgurli. The Egyptian and West African departments have been without any feature of interest, results at the mines being disappointing.

In the latter part of the year there was a marked revival of speculation, accumulated capital finding employment in creating a boom in Siberian gold and copper mines, the inflation in quotations exceeding 1,000 per cent in a few instances. As Siberia's total gold production is only about $20,000,000, the market value of over $30,000,000 given to the issues of a few English companies operating there, presages either a notable increase of production or an inevitable financial collapse. In November there was a sudden revival of interest in Deep Leads, a group of companies formed to exploit alluvial deposits in Australia, and shares that had been neglected rose to three or four times their previous prices. This led to a reconstruction of some of the companies and the flotation of new enterprises of a similar kind. At the same time diamond ventures in South Africa, especially New Vaal River shares, were bought freely and an excited market prevailed. De Beers rose in sympathy and several dormant stocks were advanced rapidly. In the last week of the year there was a marked recovery in Kaffirs, due to reports of the Boer leaders having assumed a favorable attitude on the labor question.

On the whole the speculative activity of the London market as regards mines has been curiously scattered, the great flow of capital toward South Africa having been arrested and diverted to a multiplicity of channels, with as much willingness to risk money as ever before, but with a growing tendency to demand information more reliable than that deemed adequate in former days.

Standardization.

On another page we publish the report of the Committee appointed by the Institution of Mining and Metallurgy, to report upon the standardization of screens. They recommend the retaining of the term 'mesh', mainly on the ground that it is so fortified by custom that it would be impracticable to dislodge it in favor of 'aperture'. While you are reforming you may as well reform, and there is this to be said of 'mesh' that, in South Africa particularly, it is employed in a most untechnical manner even by the leading metallurgical engineers.

Also, while the Committee undertook to define "sand" and "slimes", they might as well have made it 'sand' and 'slime', putting a taboo on the sloppy use of the plural. Why "sand" in the singular and "slimes" in the plural? These matters are not vital but, like standardization of screens, the correct use of technical terms tends toward definition of thought and clearness of of statement. Those who beggar themselves of the plural find themselves in a dilemma when they desire to speak or write concerning several kinds of a thing. But these remarks must not be taken as belittling the work of the Committee; we are of the opinion that their recommendations will find general acceptance and will be received with gratitude, as helping to lessen the confusion existing in the terminology of screens. The need of agreement in usage is emphasized in the letter from Mr. Robert H. Richards, the authority on ore dressing, whose letter we also publish.

Special Correspondence.

Leadville, Colorado.

Annual Statistics.—Excellent Showing.—Big Production of Zinc.—New Development Work.—Breckenridge News.

Notwithstanding that the Leadville mining district has been handicapped seriously during the past year by car shortage, lack of smelting facilities, and dearth of labor, a good showing has been made. From a thoroughly reliable local source the following statistics are available:

Gold	52,573,386 oz	valued at	$20.67	$1,086,692
Silver	4,889,160 "	" "	0.667	3,265,524
Lead	49,422,753 lb	" "	0.056	2,790,408
Copper	5,466,641 "	" "	0.192	1,049,814
Spelter	110,483,400 "	" "	0.060	6,686,455
Manganese	36,000 tons	" "	8 00	288,000
Total				$15,166,893

The tonnage of the district was divided among the following classes of ores: Lead carbonate, 102,112; iron oxide, 163,760; iron sulphide, 276,109; zinc sulphide, 223,565; silicious, 107,875, and manganese ores, 38,000, making a total of 916,721 short tons.

Attention is called to the enormous increase in the production of zinc, which exceeds the total value of gold and silver; while the tonnage is not what was predicted, it does credit to a district embracing a territory but little over three miles square. The total value of the metal products for 1905 was a little above $13,000,000, against $15,000,000 for 1906, making a total production to date of $353,000,000. The following figures show the tonnage produced by some of the larger companies during the year:

Iron-Silver	145,450	short tons
Midas	143,125	" "
A. Y. & Minnie	88,000	" "
Western	103,045	" "
Reindeer	35,000	" "
Morning Star Con	55.000	" "
New Monarch	25,200	" "
Ibex (Little Johnnie)	80,725	" "
Yak	85,000	" "

Of the ores produced by the camp a large portion (except zinc) was treated by the local smelter, which employs 1,000 men, has in operation 10 blast-furnaces and a capacity of 26,000 to 28,000 tons per month. Of the spelter product all but 7,500,000 lb. was smelted outside the State. A district which in 1906 has prodneed more than 110,000,000 lb. spelter has strong claims to recognition as a producer of this important product.

Prior to 1898 the zinc deposits of this district did not receive particular attention. The low grade of the ore did not permit of its being treated directly except in a few exceptional cases where the product as mined had a zinc value of over 40%. But with the advent of magnetic and static separators the zinc ore is being marketed with a zinc value as low as 18%. Coupling the electric treatment with the high-standard wet-concentrating tables of the present, the mills of Leadville are producing a zinc product of 35 to 45% and above. It may be mentioned in this connection that the district produces but a small tonnage of strictly zinc ore. The supply of zinc is derived from the iron-lead sulphide bodies principally, and belongs to what is styled the sulphide zone. Fortunately for the metallurgist, the zinc carries but a small percentage of the precious metals, which accompany the iron. With the completion of the mills now under construction or enlargement, the total milling capacity will approximate 700 tons per day of crude ore.

Among the producers soon to be added to the Breece hill list is the old Chippewa property. Already the new company operating under the style of Ingomar Real Estate, Mining, & Leasing Co., by raises and drifts from the old workings, has opened up a very good grade of ore and shipments will be made soon. One of the mines of the district that has been quietly making a record during the past year and which has a most flattering prospect is the New Monarch, on Little Ellen hill. This property produced 25,200 tons during 1906 and enjoys the distinction of producing the highest grade of ore shipments. With the completion of the development work as planned for the present year, this mine will stand near the head of the list of important producers. ——The manager of the Wellington mine, near Breckenridge, reports a large ore reserve in that property that will require milling facilities. The Oro and Orthodox groups have been added to the Wellington and will be operated by the Colorado & Wyoming Development Co., which is capitalized at $10,000,000. The company contemplates erecting a 300-ton concentrating mill, and has recently entered into a contract with the Colorado Zinc Co., of Denver, to ship it 75 tons of ore daily. J. T. Hogan, manager of the Jessie, states that the oxidized ores of that property can be treated successfully by the cyanide process, and that a large leaching plant will be installed for that purpose during the present year.

Toronto, Canada.

Mining Under Cobalt Lake.—Prospects at the Nipissing.—New Gold Discoveries.—An Oil Boom.—More Companies Incorporated.—Speculative Activity.—Excitement in Hastings County.—Coal Mining in Nova Scotia.

The syndicate that last week purchased from the Ontario Government for $1,085,000 the mining rights to the bed of Cobalt lake, will turn over the property—at a substantial advance, of course—to the Cobalt Lake Mining Co., which has just been organized for the purpose of developing it, with a capital of $5,000,000. The carrying out of the scheme has been attended with a good deal of trouble and dissatisfaction, as the amount of money required by the syndicate to effect the purchase was considerably oversubscribed, and many of the would-be ground-floor participants have been left out. Litigation has already resulted. The following directors have been elected: Sir Henry M. Pellatt and Britton Osler, of Toronto; T. Birkett, G. F. Henderson, D. B. Rochester, H. S. Southam, and Frank Latchford, of Ottawa; John H. Avery, of Detroit, and G. E. Drummond, of Montreal. The company will proceed with active mining operations as soon as possible. As the gravel of the bed of the lake is rich in silver, dredging may be undertaken, in addition to sinking a shaft and driving under the water, which is about 40 ft. deep.

Charles A. O'Connell, manager of the Green-Meehan mine, reports that high-grade ore is being taken out at the rate of about one ton per day. A car of ore will shortly be sent to the smelter at Copper Cliff, Ontario—instead of to New Jersey—as an experiment. A statement to the stockholders of the Nipissing handed out on December 26 (in connection with the payment of a quarterly 3% dividend and an extra dividend of 2%) intimated, on the authority of the superintendent, W. H. Linney, that during the two years of operation $2,500,000 worth of ore had been mined at a total expenditure for all purposes of $225,000. Only six veins on the property are being worked. The decrease in value in the ore of vein No. 19 is admitted. The production for the last four months has averaged about $200,000 per month, but will probably be less during the winter months. Owing to the time of year no new exploration work can be done on the unprospected property, but such work should be promptly undertaken in the spring. The character of the mining is such that it is impossible for any one to determine the number, width, depth, or value of ores exposed on the

surface or to be exposed under the surface that could be developed on the portion of the property which has not been deforested. The company has produced more than $2,000,000 net from an area of less than 10% of the total acreage of the property.

A rich find of gold at the Minnehaha mine, on Minnehaha lake, in the Manitou lake district, northwestern Ontario, is reported.——The Pearce mispickel mine in Marmora township, Hastings county, Ontario, which has laid idle for several years, will shortly re-open. It carries a good percentage of gold with arsenic and the increased price for arsenic encourages the belief that it can be profitably worked.——The Hickey Oil Co., of Detroit, operating in the Leamington-Comber oilfields in Essex county, Ontario, has wound up its affairs. It struck oil rich about two years ago, but the gushers did not hold out. The company disposed of about $15,000 worth of oil, and drew $7,000 in bounties from the Canadian Government, but the cost of machinery and well construction absorbed its funds and the total losses will be about $14,000.——An oil boom is on in Manitoulin island, Lake Huron, where about 100 wells have been sunk at a cost of about $500 each. It is claimed that St. Joseph's island, near Sault Ste. Marie, is in the same formation and has similar oil-bearing qualities.

There were 17 Cobalt, Larder Lake, and other mining companies incorporated this week, with an aggregate capital of $17,150,000, and this is by no means a record week either. Most of them will issue dollar shares. The largest capitalization is that of the Nipissing Copper & Silver Co., Toronto, $3,500,000. The mining rights to the bed of Kerr lake, Cobalt area, about 23 acres in extent, recent tenders for which were declined by the Provincial Government as not being high enough, are again offered for sale. The new tenders will be subject to a royalty of 10% on the gross value of the output.

There is great excitement in the Hastings mining district, in eastern Ontario, over the discovery of a rich vein of gold-bearing ore about nine miles north of Madoc village. It was found by E. B. Davis, an experienced man, who has been engaged in local mining for many years. A sample weighing about 10 lb. has been brought to Belleville and closely inspected by experts. It consists of milky quartz, dolomite, and black country rock, thickly studded with gold, which shows in specks in both the quartz and the dolomite. Particulars as to the extent of the deposit have not transpired.

The Dominion Iron & Steel Co., of Sydney, Nova Scotia, in which Toronto capital is largely invested, having had considerable trouble over the coal supply for which they had contracted with the Dominion Coal Co., have determined to mine their own coal. They have just concluded an arrangement to purchase from Thomas Routledge, and others associated with him, large areas in the immediate neighborhood of their works at Sydney; these they will develop as soon as possible. The capacity of the coal measures secured is estimated at several hundred million tons of coal, which will enable the steel company to export largely in addition to satisfying their own requirements.

Republic, Washington.

Review of Progress.—The Methow District.—Much Activity in Okanogan County.—Chelan District Prospering. — Exploring the Colville Reservation.—The Metalline District.

In the Methow district, during 1906, the Antimony Queen Co. operated the Dixie Queen mine, and shipped several large slabs of stibnite that weighed from 500 to 1,000 lb. each. Since then the company has been shipping ore in carload lots. The Seattle Smelter Co. has ordered machinery for a 10-ton furnace to be installed on the Gold Creek antimony belt next spring, and if it proves successful a plant will be installed to handle the entire output of the district.

In the old Ruby camp, near Conconnully, the Ruby mine, controlled by Johnathan Bourne, of Portland, Ore., has been largely exploited by shaft and tunnel work, but on the plan of sawing wood and saying nothing. The Arlington group, adjoining, which has thousands of tons of ore blocked out in the underground workings, was equipped with a hoisting and compressor plant, and considerable work was done in the mine. Minneapolis people purchased the Ruby-Payne and Seligman group of claims last summer and started extensive exploratory work on them.

The western part of Okanogan county showed more than usual activity during 1906. In the Twisp district a fine body of ore was struck in the Capital mine, and the company contemplates the erection of a mill. On the Red Shirt mine, adjoining it, a large amount of exploratory work was done, and the owners are figuring on hoisting machinery. The Alder mine is coming to the front; for twelve years the original owners held it, content with performing the annual assessment work. Anywhere at the suface the quartz will pan gold to the extent of $10 per ton. Three years ago systematic development was started, and three tunnels have since been driven. The No. 1 cross-cuts the vein at a depth of 50 ft.; at that depth the vein is 40 ft. wide. On that level traces of copper were found, but the gold is in pyrite and will not pan. The No. 3, or main adit, was started last year and driven 200 ft. It is expected to tap the vein at a depth of 400 ft. The Alder group comprises three claims on a vein that has been exposed by open-cutting at different points for a distance of one and one-half miles. Railway transportation will soon be available between Wenatchee and Oroville, over the V. V. & E. branch of the Great Northern system. A survey has been made for a connecting branch to the Alder mine, 30 miles, following up the Methow river from Potero to the Twisp, which empties into it The post-office town of Twisp is situated at the confluence of the two streams. The Bonita, on Slate creek, one of the oldest mines in Washington, with a vein 60 ft. wide of milling ore, was comparatively idle for several years until 1906, when the management passed into the hands of A. W. Hawks. A 10-stamp mill was built, and the first brick under the new administration was turned out early last fall. The mine has enough ore blocked out to last for several years. The present output is 30 tons per day, but with additional milling capacity this will be increased. The Lane process is used, and a saving of 95% is reported.

The Chelan district has a number of excellent outcrops, on which considerable work is being done, and while they have not been developed into paying mines, they are a good deal more than mere prospects. The orebodies are large and the values fairly good but the lack of transportation has retarded development. Last winter J. P. Graves took a bond on the Holden property and last spring he started work and has employed ten or twelve men on it ever since. When Mr. Graves took hold of it, he thought it was a low-grade copper property, similar to the Granby, but the work done has demonstrated that the new bodies of ore may be classed as high grade. This property is situated on Railroad creek, about 15 miles west of Lake Chelan. Already over 300 ft. of depth has been attained on the vein, and the No. 3 adit, which will be continued all winter, will give a depth on it of 550 ft. The vein runs the length of three claims and at the surface is approximately 100 ft. wide. The ore is valuable chiefly for copper, but gold also occurs. The No. 3 adit is cross-cutting for the vein and is expected to tap it shortly. The Chelan mountains are

precipitous, and on account of the topography and the magnitude of the vein, it will be possible to glory-hole the orebodies, as is usual in the Granby mines. A smelter will have to be established on the ground to take care of the output, and it will therefore take some time to put a mine on a dividend basis. A survey has been made for an electric railway from Lake Chelan to Spokane. Holdings on the lake and Chelan river have been acquired for the development of electric power on a large scale, and the future of this region is auspicious.

All of that part of the Colville Reservation in Stevens county, tributary to Orient, in Ferry county, has experienced unprecedented mining activity. A view from the heights above Orient, is sufficient to convince one of the unqestionable importance of the surrounding area in comparison with other districts in eastern Washington and British Columbia. The prevailing rocks are granite, gneiss, and schist, and these formations are cut by andesite dikes. The ore is in fissures and on contacts. Veins of pyrite, assaying in gold, silver, and copper, are usually of great width. Under competent management several mines in this region, including Kettle River and Pierre Lake districts, have demonstrated their worth within the year just past. Among them are the First Thought, Napoleon, Easter Sunday, Orient, Pomeroy, Chief & Butte, Minorca, Swamp King, Abe Lincoln, Globe, Regina, Copper Butte, American Flag, Trojan, Tenderfoot, Big Iron, Defender, and Golden Crown. The First Thought mine, owned by Patrick Burns, has opened up considerable ground, from which ore was shipped steadily during the past two years, and the yield of gold was larger than that from any other mine in the State for the same period. Last November an aerial tramway was constructed from this mine to the railway, and now the output will be steadily increased. The ore is purely gold-bearing. The vein is a contact between granite and porphyry.

The Napoleon mine near Kettle river, about 10 miles south of Orient, produced about 11,000 tons, which came mainly from surface quarrying. This mine was purchased by the British Columbia Copper Co. for the purpose of supplying its smelter at Greenwood, B. C., with basic flux. The ore is iron sulphide and contains gold and copper. During the year a great deal of underground work was completed. The company has made arrangements for the construction of a tramway and expects soon to install extensive machinery, with a view to increasing the output to 500 tons per day. On Sulphide mountain, the Easter Sunday mine, owned by the Waukegan & Washington Mining Co., was explored by crosscuts, and ore, rich in gold, silver, and copper was uncovered. The vein is 20 ft. wide. This mine is one of the best equipped, as regards machinery, on the Reservation. Two 100-h.p. boilers and machinery of the most modern type was installed, and close to $100,000 has been expended upon the property. The company expects to build a mill, and in the meantime will ship its ore to the smelters. On the Orient $40,000 has been expended in development and equipment. It has a compressor plant and steam-hoist. Considerable ore, carrying copper and gold, has been piled up on the dump, but the mine has not yet entered the shipping list. The main adit has been extended and the vein was intersected at a depth of 250 ft. Within this part of the Colville Reservation there are a number of first-class prospects that may become productive with exploration. Last year a large number of veins were uncovered, and the district is constantly commanding fresh capital for purchase and development. The whole area surrounding Orient is heavily timbered and well watered, and the transportation facilities are excellent.

The Metaline district became prominent last year through its deposits of silver-lead ore, the principal mines being the Morning and Mammoth. Several other companies are operating in the district, and a large amount of work was done, chiefly in tunneling, the particulars of which were recorded in this journal through the year. Cedar Canyon district has also experienced prosperity, mainly through the purchase of a group of claims, on which a good quality of tungsten ore was discovered, and the introduction of capital by the Krupp company, of Essen, who purchased the claims last fall and have since been industriously blocking out ore, on which 40 men are employed. This company has ordered a concentrating plant at a cost of $80,000.

In the Chewelah district, some discoveries of copper were made last year, and the development of rich silver ore in some of the mines was reported. The United Copper Co. purchased three claims and a fraction for $25,000, and it owns five others. The company sank a shaft on a vein four feet wide at the surface. At the depth of 150 ft. the vein was cross-cut and found to be 40 ft. wide, 18 ft. of it being good copper ore. The shaft was sunk to the 200-ft. level, where the vein was again intersected. A contract was made for 1,000 tons of ore to be delivered to the Northport smelter. The ore contains an excess of iron and carries gold and copper. The company pays $1 per ton for hauling to the railroad and $2.50 per ton for freight by rail and treatment. The ore is trammed from the shaft to the wagon-road, near the portal of the adit. The Jay Gould mine became a shipper of silver-lead ore to the Tacoma smelter last fall, and the returns from the last carload showed a yield of 45 oz. silver per ton, without sorting. The main shaft is down 200 ft. On the 100-ft. level the vein is 25 ft. wide.

Butte, Montana.

Re-Opening of the Blue Bird.—A Mine with a History.—Butte Central Acquires More Property.—Another Consolidation.—The Gagnon Being Developed.—A Liquidation.—Views of Rossi.—Mining in the Coeur d'Alene.

It is stated that the Blue Bird mine is to be acquired by a syndicate headed by Arthur P. Heinze, of New York, vice-president of the United Copper Co. and brother of F. Augustus Heinze. The intention is to organize a development company, and later, if results justify it, to reorganize as a mining company. The Blue Bird is situated a few miles west of Butte, and 15 to 18 years ago was a good silver producer. The property was backed by the present Lord Overbury (formerly Sir John Lubbock) and his son-in-law, Ferdinand Van Zandt, was manager of the property. The mine was splendidly equipped and a 90-stamp mill was erected. Owing to the disappointing returns from the mine and the consequent suicide of Van Zandt, the mine was shut down and for 15 years it has been idle; the surface plant has been torn down and carted away, and no work has been done except by a few lessees, who have been gophering near the surface, taking out some good silver ore. The Blue Bird shaft is 700 ft. deep and nearly filled with water. Prior to 1893 this part of the district was very active, and three or four other mines were good silver producers. The Davis-Daly Estates Co. owns three good claims there, namely, the Great Republic, Last Chance, and Hibernia, all of which have been developed. The Anaconda Co. owns the Nettie claim, which has been opened to a depth of 400 ft. The Trenton Co., another amalgamated concern, owns a number of claims, including several developed properties. The Hibernia, Nettie, and Burlington, in addition to the Blue Bird, have been the chief producers. For 12 or 15 years, however, these mines have shown no signs of life and have been in the

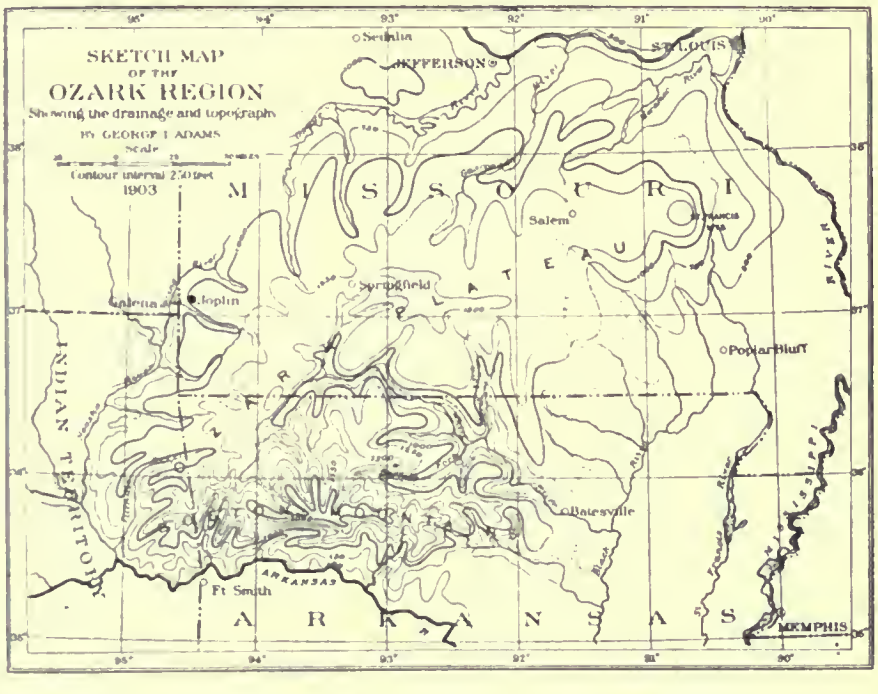
care of watchmen. It is the opinion here that some of these properties could again be worked for silver at a profit, and that with greater depth copper would be found. It is understood that the interest Mr. Heinze is taking in the Blue Bird is independent of his brother and the United Copper Co.

The Butte Central & Boston Copper corporation has secured possession of some ground in the northeastern part of the Butte district that has been taken up on leases and options by a concern known as the Butte Northern Copper Co., but which could not handle the property. It is stated that the Butte Central & Boston has also acquired other ground in the same vicinity, giving it between 90 and 100 acres of mineral ground lying between the properties of the Butte & Bacorn and Butte & London. A large vein outcrops in one of the claims taken over from the Butte Northern. It is the intention of the Butte Central to equip the new purchase and begin development work immediately. The new acquisition is about three or four miles northeast of the Ophir mine, the other property purchased by the same company. The development work on the Ophir is progressing satisfactorily and the big orebodies found on the 300 and 500-ft. levels are being opened up.——The Butte-Milwaukee Co. has begun sinking its new shaft on the Colonel Sellers claim, but the work is handicapped by the fact that therailroad spur has not been completed to Sellers and it is difficult to get timbers and supplies to the ground. Negotiations are on foot for a consolidation of the Alliance and Farrell mining companies, and the the prospects are that a merger will result as soon as terms can be agreed upon.

The shaft of the Gagnon mine, owned by the Trenton Co., has been sunk to a depth of 2,100 ft., at which point a station is being cut. The vein is close to the shaft; it is the vein that dips from the Clark Original mine on the east; it was found on the 2,000 by the Trenton and as it has a flat dip it was concluded that 100 ft. deeper would bring it entirely within the Gagnon ground. The experience of the Trenton Co. with the Gagnon is but a repetition of the experiences of other companies in the Butte district. The upper workings yielded only silver ore, and when the silver deposits gave out it was surmised that the Gagnon had been worked out. That was its condition when it became the property of one of the Amalgamated subsidiaries. Exploration was resumed, with the result that good copper deposits have been opened, and the prospects are that the Gagnon will become a big producer of copper.

The Boston & Montana Co. has reached a depth of 100 ft. with its big three-compartment shaft on the Badger State. This claim has the extension of the rich vein of the Jessie mine of the North Butte Co. The shaft is to be used for the development both of the Badger State and the Aurora, an adjoining claim owned by the same company. The shaft will be sunk to a depth of 1,800 ft. before any attempt is made to develop the vein; it is equipped only with a small and temporary engine, but a large one has been ordered.——The affairs of the Black Rock Mining Co. have been wound up, and the company has practically gone out of existence. It was working the Black Rock mine under a lease and has sold its interests to the Butte & Superior Copper Co., which is now in possession of the mines, including the Niagara, Raymond, Jersey Blue, and Constitution. The new company is sinking a big and deep working shaft on the Black Rock, through which the entire group will be worked.

The Amazon-Butte Mining Co., under the direction of John Hewett, formerly superintendent of the Gagnon mine, is making rapid progress in shaft-sinking on the West Altona, a depth of more than 100 ft. having been attained. The shaft is being strongly timbered and will be taken several hundred feet deeper as rapidly as possible. Some cross-cutting may be done at the 200-ft. level, but there will be no interruption to sinking. Good ore near the surface is being mined by lessees, who are paying royalties. The company itself is after the big fault-vein of the Bullwhacker, which is known to pass through the Altona.——Herman J. Rossi, mayor of Wallace, Idaho, has been on a visit to Butte. He says that Butte capital is responsible for the present boom in the Coeur d'Alene, and that the output of the region has been doubled as the result of it. Mr. Rossi thinks the Snowstorm mine at Mullan, in which the Greenoughs are largely interested, is one of the greatest copper mines in the world, considering its stage of development, and that the Stewart, owned by F. A. Heinze, will also turn out a big producer. He claims that there are more opportunities open in mining in the Coeur d'Alene than anywhere else in America, and that the results are quicker and larger.



Joplin, Missouri.

Record Output for 1906.—Lead and Zinc Production Increased.—Comparative Statistics.—Local News.—Several New Finds.—Successful Leasing.

In the year 1906 some history was made for the zinc and lead districts of southwest Missouri and southeast Kansas, for all previous records were broken. Many new mines were put into operation during the year, many more are being discovered daily, and while 1906 reached the highest mark, the new year gives promise of doing even better if the weather conditions are favorable and the price of both lead and zinc remain where they are. The highest price paid for zinc ore last week was $19.50 per ton; for lead ore, $87 per ton. The highest price of zinc

ore in 1906 was $54 per ton in January; the highest price in the previous year was $60. The highest price of lead ore in 1906 was $87 the last week of the year, against $80 the year before. The shipment for last week was: Zinc ore, 10,780,080 lb., valued at $240,186; lead ore, 1,702,930 lb. valued at $70,510; combined value, $310,696. The shipment for the 52 weeks of the year was: 557,859,470 lb. zinc ore valued at $12,079,602; and 78,377,950 lb. lead ore valued at $3,048,573, with a combined value of $15,128,175. The shipment for the year 1905 was: Zinc ore, 504,801,940, valued at $11,334,320; lead ore, 63,758,700 lb. valued at $1,968,480; combined value, $13,302,800.

George E. Ladd, of the Rolla School of Mines, who has been operating in this district for several years and who is now mining on the Bruce land at Belleville, is opening up a good prospect at a depth of 97 ft. He has cut into the orebody a distance of 20 ft. and has found an underground cave lined with zinc and lead ores. The cave has been explored a distance of 100 ft., showing the same deposits of ore all the way. Several of these cave formations have been encountered in the Chitwood district by other companies.

The American Zinc, Lead & Smelting Co. has just completed the third 600-ton concentrating plant on the property between Carterville and Prosperity, and it will be started up within the next few days.——The German-American Mining Co., operating on the Vantage Co.'s land north of Webb City, is now opening up a 14-ft. face of rich zinc ore.—The first turnin of lead ore from the mines at Springfield, Mo., was made last week and consisted of 88,000 lb. The Trolley Mining Co., consisting of E. J. Pratt, T. E. Palmer, and E. McMeechan, all of the Southwest Missouri Electric Railway Co. is opening up a good lead prospect on a sub-lease of the Matthews & Wampler lease on the Four Hundred Prospecting Co.'s land, southeast of Duenweg.

H. C. Johnson, who recently took a lease on the Four Hundred Prospecting Co.'s lease on the Schifferdecker land, near Diamond, made the first turnin from that land last week amounting to 300 lb. lead. This is a very small amount, but in a short while the mine is likely to become a good producer.——Conklin & Ritter, owners of the Paxton mine on the Missouri Lead and Zinc Co.'s land last week cleaned up 100 tons of zinc ore. The ore is among the highest grade in the district. The mine was opened up some time ago in a peculiar way; it was thought it had been worked out and it was almost on the point of being abandoned when it was decided to sink a few feet on the hard ground at the bottom of the shaft. They only sank a few feet through the lime when they went into open ground again and also into what has seemed since a regular jack bin.

The Avondale and Dominion mines, owned by Messrs. Dodge & Patton, of Webb City, operating on the Aylor land at Prosperity, have produced $400,000 in three years. This ore came from a 50-ft. face of ore, which continues at least 25 ft. deeper with equal richness.

Calumet, Michigan.

Output of Copper in 1906.—Estimate of Profits.—Tendency to Consolidate.—Latest Rumors on the Subject.

In the year just ended the Lake Superior mines produced roughly 225,000,000 lb. copper. This is a slight gain over 1905, but the marketable supply will be less than in that year as Calumet & Hecla will presumably have no surplus for sale. If we assume an average price of 19 cents, the gross receipts amounted to $42,750,000, and if the cost be taken at 10 cents the net earnings would aggregate $20,250,000. The year has been marked by the entrance to the producing ranks of Victoria, Tecumseh, and Winona, and the retirement, temporarily, at least, of the Atlantic.

While the above figures make a very handsome total, 1906 will be noted not only for its large earnings, but for a new tendency that has now become quite general. This is to consolidate the smaller companies. Looked at in a broad way, it is rather remarkable that this was not begun before. Michigan is the only great camp which is distinguished by a large number of producing companies. Butte, with an output of 350,000,000 lb., is controlled almost entirely by the Amalgamated and its allied interests; at Bisbee, which has now reached an output of 150,000,000 lb., there are only three producing companies; at Cananea, Mexico, destined to become one of the great camps of the continent, there is only one company of importance, and so on around the circle.

As one studies the Michigan map he is at once impressed by the innumerable number of small properties with irregular outlines, one cutting into another and in many cases preventing the carrying of operations to depth. Probably only the Michigan law, which confines companies to the vertical limits of their properties, has delayed so long the amalgamation of the smaller concerns. Of course there has been innumerable swapping of 'forties' for mutual advantage, but until 1906 there was no movement toward a broader policy. Now it begins to look as if it would boil down to half a dozen large operators. The tape suggests the combination of all the mines on the Kearsarge lode to the north of Calumet & Hecla. This would include Centennial, Osceola, Wolverine, Allouez, Ahmeek, and Mohawk. The action of all these stocks indicates buying for control. To the south of Calumet, Quincy may be left as the sole survivor. The south range mines will very likely be divided between Calumet and Copper Range. The movement is not so pronounced in the Ontonagon county mines but here also there are rumors of acquirement by the larger interests.

Not only are the producing mines apparently to be combined, but the undeveloped mineral lands are being rapidly taken up simply as a matter of acreage. In the upper peninsula Keweenaw Copper and Calumet have already acquired enormous holdings When it is considered that several of the most valuable producers of today were for a long time considered worthless and only of late years have been earning money, it will be seen that the possibilities here are tremendous. Some may regret, for sentimental reasons, the passing of the old regime, but concentration of management is the order of the day and Michigan is simply falling into line.

Salt Lake, Utah.

New Smelter Site.—Developments at Tintic.—Another Smelter.—Ore Shipments.—Gold at Pelican Point.—Transfer of Ontario & Daly Mines.—Nevada-Douglas.—Local Stock Business.

The management of the Utah Consolidated Mining Co. has settled its own 'smoke' question by selecting a site for its proposed $1,000,000 smelting plant on the west side of the Oquirrh range of mountains and near the town of Tooele. A tunnel will be started at a point between one and two miles above the smelter site and run through the mountain 11,000 ft. to a connection with the orebodies of the Highland Boy mine, tapping the same about 1,000 ft. below the lower adit level. Pending a completion of the tunnel an aerial tramway will be built and operated over the mountain. The company will build several miles of railroad track to connect with the main lines of the Western Pacific and Los Angeles & Salt Lake railroads.

Important developments have been made on the 1,700-ft. level of the Lower Mammoth mine in the Tintic dist-

riet. The main shaft was sunk to this level recently and a drift run from the bottom to connect with the ore. The body shows a width of 20 ft. and the greater portion of it is rich enough to ship.——The officers of the Tintic Smelting Co. have selected a site for the smelter they purpose building. The plant will be conveniently reached from all the mines of the Tintic district and will only be a short distance from the main line of the Los Angeles & Salt Lake railroad.——Jesse Knight, of Provo, is said to have purchased a controlling interest in the Eureka-Swansea mines. The Yankee Consolidated and Beck Tunnel Consolidated companies have entered into an agreement establishing vertical lines as the boundary between their respective properties, thus avoiding any controversy in the future over apex rights.——The ore shipments from the Tintic mining district last week were not as heavy as usual owing partly to bad roads and disorganization due to the holidays. There were sent to the Salt Lake smelters, however, 119 carloads of ore, the contributing mines and their amounts being: Ajax, 2; Beck Tunnel, 8; Bullion Beck, 7; Carisa, 2; Centennial Eureka, 38; Eagle & Blue Bell, 9; Eureka Hill, 2; Grand Central, 3; Joe Bowers, 1; Mammoth, 14; May Day, 2; Paynter, 1; Scranton, 2; Swansea, 2; Tintic Iron, 4; Uncle Sam Con., 1; Victoria, 6; Yankee Con., 6 carloads.

Considerable interest has been aroused in some recent discoveries of low-grade gold ore on the west side of Utah lake, in Utah county, near what is known as Pelican Point. The character of the ore is similar to that at Mercur. A syndicate of Provo, Seattle, and Eastern parties has acquired a large group and organized the Pelican Point Mining & Development Co., with Judge W. N. Dussenbury, as president. The headquaters of the corporation is at Provo. It is claimed that sufficient development has been performed to warrant the construction of a cyanide mill.——The fuel famine at the Consolidated Mercur has been so much relieved that the management has started some of the roasters again. During December this portion of the plant was out of commission and only the oxidized ores received treatment.

An important deal affecting Park City mining property was affected in New York last week when the control of the Daly and Ontario, two of the oldest mines in that camp, passed to Jacob E. Bamberger, president of the Daly West Mining Co. It is believed that Mr. Bamberger will consolidate these mines. The Ontario has paid about $14,000,000 in dividends. Aside from its metal-mining property the Ontaria company owns the Weber coal mines at Coalville, about 15 miles from Park City, and also some valuable water rights and franchises, including the electric lighting and power system of Park City.

The management of the Nevada-Douglas copper mine at Yerington, Nevada, has placed a large order for mine equipment. Walter C. Orem of Salt Lake is manager. E. P. Jennings, a Salt Lake mining engineer, recently made an examination of this mine and reported that it contains 10,000,000 tons of available ore with an average copper content of 3½%. By treating 1,000 tons per day, Mr. Jennings states, the mine is capable of producing 24,000,000 lb. of metal annually at a cost in New York of not to exceed 8½ cents per pound. Mr. Jennings estimates that the cost of constructing 20 miles of railroad to connect with the tracks of the Southern Pacific system near Wabuska will be about $175,000; that a concentrating mill of 1,000 daily capacity can be built for $750,000 and a smelter of 500 tons daily capacity, for $500,000.

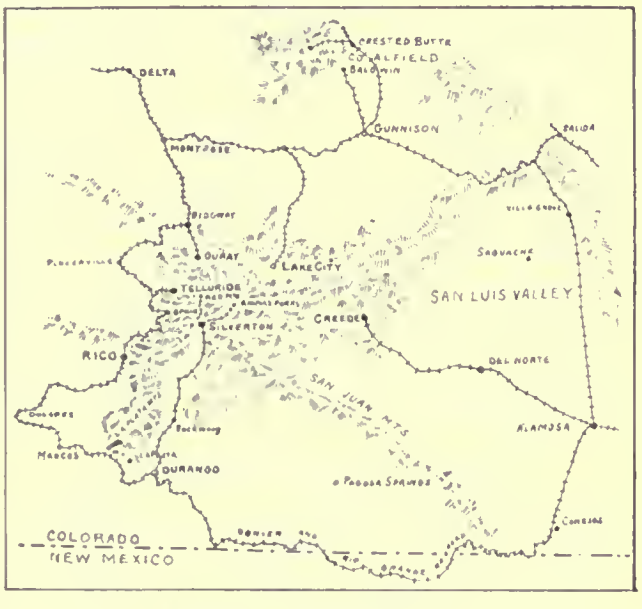
The total sales for the year 1906 on the Salt Lake Stock & Mining Exchange amounted to 14,555,391 shares, for which was paid the sum of $9,178,983.

Denver, Colorado.

Annual Statistics.—Fine Record for 1906.—Cripple Creek and Leadville Leading.—Excellent Dividend Showing.—Smelters do a Big Business.—Zinc Output of Leadville.—The Old Gold Districts.

Statistical data prepared for the year 1906 show that the mining industry of Colorado has had a remarkably successful year. Colorado's mines have paid $17,794,784 in dividends, while the lessees have netted about $5,000,000 during the year. The production of gold namely $26,895,517, is an increase over the three preceding years, and is only exceeded by the output during 1900-1902 inclusive. The total production of mineral for the past year, including gold, silver, lead, copper, zinc, and tungsten was $49,810,295—a record figure. The output of coal has increased steadily, reaching $18,500,000 during the past year, a gain of $3,000,000 over 1905.

The biggest gross production comes from Teller county, which is identified with Cripple Creek; this district pro-



Map of Southwestern Colorado.

duced $17,790,000 in gold. The second in rank is Lake county, where Leadville is situated; the gold production is estimated at $1,249,403; silver, $1,101,394; lead, $3,051,261; spelter, $1,511,758; and copper, $875,008, making a total of $13,884,324. Teller and Lake counties are responsible for three-fifths of the metal production of the State. The second gold-producing county is San Miguel, and then come Gilpin, Lake, and Ouray, ranking equally with a production of about $1,250,000. In silver, Leadville of course is easily first; Pitkin county, which contains Aspen, being second, with $1,367,118. No other county produced a million dollars in silver, although San Miguel came close to it. In dividends, Teller county is ahead, with a record of $6,313,000. Lake county is second, with $2,070,000.

The smelters and mills of Colorado did a big business, their total gross output being nearly $83,000,000, of which $33,681,223 represents the business done by the American Smelting & Refining Co., and $25,054,929 the gold received at the United States Mint at Denver. It is evident that the mint and the smelters received a good deal of ore from the surrounding mining regions outside of Colorado.

At Cripple Creek there was much activity. Five mills have recently been completed—four cyanide plants, and one combination of chlorination and cyanide—which will swell the production for 1907. Better rates have

been secured from the mill and smelter trust, and from the Golden Cycle Milling Co. The new drainage adit is to be started at once, and is expected to reach the El Paso shaft in two years, and the Vindicator in three years more.

In the San Juan region, comprising the southwestern portion of Colorado, the yield of gold aggregated $4,952,000; this is a slight decline from 1905, which is partly explained by the enforced idleness of the Silver Lake mill at Silverton and the Camp Bird plant at Ouray, while another important factor was a general shortage of labor, skilled and unskilled, throughout the year. In Lake county, the production of zinc is of growing importance; the output of this base metal exceeded that of the precious metals in value. It will be remembered that Leadville started as a gold camp, then became famous as a producer of silver and lead, and now zinc has become the most important product. The erection of custom mills for the treatment of low-grade zinc ores was an important feature of the last year.

The pioneer gold belt, embracing the counties of Boulder, Gilpin, and Clear Creek, is doing fairly well. Some of the mines in these districts have been in continuous operation since 1859. The following gross outputs and dividends are recorded :

County.	Gross Output.	Dividends.
Boulder	$ 581,293	$150,000
Gilpin	1,552,327	425,000
Clear Creek	1,166,730	780,000

In Boulder county the mining of tungsten ore has been a feature, the output being valued at $325,000, which is not included in the above total. Also fluorspar, to the value of $28,000, was shipped to the steel works at Pueblo. In upper Clear Creek there has been much activity, several new mines and mills having been started, so that the outlook is good.

Cripple Creek, Colorado.

Annual Report of Stratton's Independence.—Interesting Figures.—Output from the Acacia.—Standard Leasing Co.—Strike in the Granite.—United Mines Co.—Litigation with the Londonderry.

The annual report of Stratton's Independence, Ltd., for the year ending June 30, 1906, is to hand and shows the amount of ore shipped to have been 32,499 tons, with a gross value of $1,245,124. The division of this amount between the lessees and the company, together with the charges for freight and treatment, shows:

	Gross Value.	Freight and Treatment.	Net Value.
Lessees	$1,214,942.20	$320,233.27	$924,708.93
Company	181.96	164.83	17.13

Of the net value of their ore the lessees received $583,739 as their proportion, the difference of $352,969 being the total of the royalties and percentages of profits retained by the company. The profit for the year, including the London expenses, was $228,128. During the financial year three dividends of sixpence per share were paid, bringing the total of dividends paid since the incorporation of the company up to nearly £1,000,000. The tonnage shipped was about 50% less than that of the previous year, the grade remaining practically the same. The cost of freight and treatment is comparatively high owing to the lack of a contract with the A. S. & R. Co., the latter having charged the open rate, which made approximately an increase of $1.25 per ton. From the supplementary report of the general manager, Chas. M. Becker, it is noted that the matter of erecting a mill for the treatment of the low-grade ore in the mine and on the dump should be delayed no longer. At the close of the fiscal year there were 40 sets of lessees in the mine.

S. N. Simmons, operating a lease on the Pharmacist property on Bull hill, has obtained a lease on the Acacia Co.'s ground adjoining, after having stoped up to the side line. The lease has always been worked through the Fitch shaft of the Acacia, having no connection with the Pharmacist shaft, and several shipments of good ore have been made.——A gold brick valued at $6,000 has been shipped from the Anaconda mill to the Mint at Denver. This was the result of the clean-up after the treatment of 500 to 600 tons of dump from the Lexington property. Low-grade ore from the second level of the Lexington will now be treated for the Union Leasing Co.——The enlargement of the ore-house of the Standard Leasing Co. operating the South Burns claim of the Acacia Co. on Bull hill, is nearing completion ; the ore-house will hold about 300 tons and will contain six tables, accommodating 12 ore-sorters. The ore-body being mined at a depth of 800 ft. is an extension of that of the Findley and Shurtloff and regular shipments of good grade are being made right along. The shaft has been sunk 60 ft. below the 800-ft. level, and a drift is being commenced for the exploitation of the orebody to the north.

A good strike has been made in a raise from the 100-ft. level of the No. 1 shaft of the Granite Gold Mining Co. within the limits of the city of Victor. Childs & Fehringer have this part of the Granite property under lease. The streak averages about 5 in. wide, the stoping width being 2 to 2½ ft. Three shipments have been made, returns around $30 being obtained. —— The Grace Gold Mining Co. has installed a six-drill compressor on its Squaw mountain property. Two drills will at once be put to work on development and air will be supplied for a like purpose to the adjoining properties — Home Run, Santa Rita, and the Nevada King tunnel.

A circular letter has been issued to the shareholders of the United Gold Mines Co. by the general manager, H. McGarry, giving a review of the properties acquired a few months ago by the Golden Cycle Co. from the Woods Investment Co. These include the Wild Horse, Deadwood, Requa, Damon, May B., and W. P. H. It is stated that the reserves were practically exhausted at the time of the transfer, and that leasing was going on in a half-hearted manner. Since that time some 20 new leases have been granted, and a good deal of systematic development is being done, results from which are expected during the ensuing year. With regard to the financial condition of the company, the following figures are given: "The gross receipts of ore sales from the properties for the first eight months of 1906, before we took charge, were $115,974; the amount of royalties received from this by the company were $34,302. The gross receipts for the remaining four months (December not all in) were about $34,323, the royalties received from this about $10,798." A suit is pending between this company and the Londonderry in the Supreme Court of Colorado for the sum of $67,000, which was awarded to the U. G. M. Co. in the District Court. Since the incorporation of the company eight dividends of one cent and four of half a cent have been paid the shareholders, the last being distributed in March, 1905.

A special hearing has been granted in the United States District Court, in the suit of the Vindicator Co., of Cripple Creek, against the Frankfort Marine and Akron State life insurance companies, in the case of the score of men killed there in a dynamite explosion three years ago. —— J. M. Parfet, operating on the Lucky Corner claim on Gold Hill, reports a strike at a depth of 40 ft. The vein shows a width of three feet and is said to contain five ounces in gold. Kansas City parties have recently purchased the Delmonico claim, and, since unwatering the shaft, have been driving east on the 400-ft. level to cut the extension of the orebody which shows on the surface.

Mining Summary.

ALASKA.

The Hadley copper mines, owned by the Alaska Mines Securities Co., consist of 12 claims comprising 198 acres extending from tidewater to an elevation of 1,050 ft., the ore being shipped from mine to smelter by an aerial tramway. Active developments began in June, 1905, and shipments of ore to smelter began four months later. The mine itself has paid all expenses of development and equipment, in addition to which it has recently paid three dividends amounting to $90,000. The net proceeds of the ore after deducting freight and treatment charges are $10 per ton. The ores contain 32% iron, 31% insoluble matter, 8½% sulphur, 7% lime, and are free from arsenic and antimony, making them practically self-fluxing and desirable for smelting. ——The Uncle Sam copper mine is located three miles from the Hadley group and extends from tidewater at an elevation of 1,600 ft. A vein of copper ore, containing gold and silver, 40 ft. wide and extending 1,200 ft., has already been exposed. The property is well equipped with buildings, wharf, etc., and a tramway of 1,150 ft. conveys ore direct from mine to wharf. Shipments made to smelter are giving returns of $22 per ton. Additional equipment is now being erected and the output will be greatly increased.

The traffic manager of the White Pass & Yukon railroad reports that 20 dredges will be shipped to the Yukon district this spring. The Forty-Mile region is coming to the front, seven dredges having been ordered. On the Stewart and Upper Stewart there are already two dredges, and the prospects in this district are bright for a good production. ——Robert A. Kinzie, superintendent of the Alaska-Treadwell, has just returned from Seattle, where he has been arranging for a supply of coal. He reports that 7,000 tons are on the way and 40,000 tons more are to be shipped at once, which relieves the necessity of even a temporary shutdown of the mines.

ARIZONA.

GILA COUNTY.

The most important deal yet consummated in the Globe district involves 29 claims situated within six miles of Globe, and a consideration aggregating $300,000. The properties concerned in the transaction are the Oates-Newman group of 16 claims, which have been bonded from J. B. Newman, Philip Oates, Joseph Fauli, and J. P. Fauli, and a group of five claims adjoining, owned by W. D. Fisk and J. W. Bandhauer and associates. Negotiations for the deal were under way as far back as last October, when options on the various claims desired were obtained. A force of men has been put to work on initial development, which will be prosecuted with vigor and on a large scale. The identity of the purchasers has not yet been made public, F. C. Alsdorf, recently of Clifton, acting as agent in the deal in connection with the new company's attorney, F. J. Elliott, and as manager for the mines. The first work upon the properties will be the development of the Captain claim of the Oates-Newman group, and of the Red Spring claim, formerly owned by Patterson & Wogg. Sinking for a three-compartment shaft has already begun on the Captain, and a similar shaft will be sunk upon the Red Spring. The Captain shaft will be in ore from grass roots. Three shifts will be put to work on both properties immediately, and hoists have already been ordered. The ground is contiguous and similar in formation to that upon which the Inspiration is situated. Engineers declare it the most heavily mineralized portion of the Globe district.——The option upon the pooled stock commonly known as the Phelps-Dodge interest in the Old Dominion mine has not been exercised, and Phelps, Dodge & Co. will retain their heavy interest in this property. The turning down of this deal was based upon the opinion of engineers who examined the property for the prospective purchasers and reported that they failed to find sufficient ore to warrant the purchase of the stock at the price, which was slightly under $60 per share. Messrs. Lee, Higginson & Co. acted as agents for those to whom the option was given, and whose names have not been disclosed.

MOHAVE COUNTY.

(Special Correspondence).—Henry Lorin, ex-sheriff of Mohave county, has made the first payment on the purchase of a group of mines owned by Jack Flynn and Bob Ferguson. The mines are situated south of the New London and have been developed to some extent, making a good showing of lead ore.—— Schee Brothers, of Santa Monica, are working six men in the Pinkham mine at Chloride, and shipping about a carload of ore every two days to the smelter at Humboldt. The ore is of desirable quality and brings good returns. The mine is paying its way and carrying some dead work.—— The grade for the Oro Plata mill has been completed, and it is expected the machinery will arrive in a few days. The Oro Plata is one of the best gold and silver mines in Wallapai district, and produces lead carbonate.—— J. D. Jordan is preparing the ground at the McKesson mine, south of Kingman, for the installation of hoisting machinery. The machinery is expected at the mine by Jan. 15.——Mrs. Martha Osborn, of Kingman, has received news of a strike in a mining claim at Cerbat, in which she is a co-owner. Specimens of the ore sent her are filled with gold.—— The Tennessee mine, at Chloride, is shipping ore to the smelter at Humboldt. The ore is rich in lead and carries gold and silver.——Last week the sheriff brought to Kingman from the Gold Road mine, at Acme, in San Francisco district, a bar of gold bullion worth $48,000. This is the second largest bar produced by the Gold Road Co., the other one being valued at $52,000. The ore now going through the mill is far richer than any treated during the past year.—— Foster S. Dennis has taken charge of the mill at the Berkeley mine, in Blue Mountain district, which is now in course of construction. Mr. Dennis is the owner of a one-half interest in the property, and will concentrate the ore on the dump and in the old stopes.

Phœnix, Jan. 4.

CALIFORNIA.

AMADOR COUNTY.

A large block of stock of the Argonaut Mining Co. will be transferred by sale from W. F. Detert, the principal stockholder, to a company of capitalists. It was reported that the sale was made, when N. Matthews of New York and his attorney, A. C. Ormsby, arrived in Jackson to inspect the Argonaut property. In order to secure a controlling interest in the mine the prospective buyers must obtain at least 101,000 shares of stock, the market value of which at $4.75 per share, would amount to $479,750. The Argonaut Mining Co. has purchased from W. F. Detert a piece of mineral property adjoining the company's possessions and known as the Hoffman ranch.

NEVADA COUNTY.

Otto Woehler has bonded nearly 8,000 acres of highly mineralized land at Spenceville, with the intention of developing a number of abandoned copper claims in that district. Specimen ore brought to Grass Valley from the lodes traversing the bonded property has given assays running as high as 30% copper and some gold. It is believed that the lode of the Dairy Farm copper mine runs through Spenceville.——As a result of a conference between committees from the Miners' Union and the executive committee of the Mine Operators' Association, it is believed that the end of the strike is in sight and that the men will be working in a few days. A compromise will probably be reached during the week on the basis of 9 hours underground, the miners to put in 7½ hours of actual work. The conference was friendly and a conciliatory spirit was shown by both sides, the miners, however, being firm in their demands.

The Banner mine, near Nevada City, is out of fuel, and only the pumps are running, wood being burned under the boilers.—— The miners at the Murchie and Mountaineer mines are now working eight hours. It is thought that soon every mine in the district will be running on the eight-hour basis.

The strike is still on at Grass Valley, and the Conlan is the only mine at work in the district, about 12 men being employed at this property, while 650 men are idle in the region. The Kenosha, California, and Jenny Lind mines were reported to have acceeded to the demands of the Miners' Union, but they are still closed. The Mine Oper-

ators' Association has made a public statement to the effect that they feel they were unfairly treated by the men when they walked out without giving due notice of their demands, and that the owners think the Union should have communicated their demands, and allowed a reasonable length of time for the operators to accept or reject the proposition. The Union demands seven and one-half hours' actual work, and offers to either go down or come up on company time, and eat on their own time at noon, claiming that this is the system in use in most of the important camps throughout the West. On the question of demanding an increase of wages for the carmen and shovelers, 451 votes were cast in favor of such a demand, but the vote of 114 against the proposition defeated it by the narrow margin of two votes, since a three-fouths vote is required to decide questions of this kind.

(Special Correspondence).—The recent heavy snow-storms have retarded mining, but everybody is well pleased, as an abundance of water for all purposes is assured for the entire year. A number of new properties are to be opened as soon as the weather clears. The Delhi mine, at Columbia hill, which has already paid $600,000 in dividends, recently opened exceedingly rich ore. One hundred tons were milled yielding $50 per ton. The owners have expended over $45,000 during the last two years in surface improvements and dead work.——The North Star recently declared a dividend of 40 cents per share, being $100,000. A company headed by Frank A. Garbutt, of Los Angeles, recently purchased several claims from John H. Keller of Graniteville. It is planned to drive a tunnel 1,500 ft. long to obtain 800 ft. of back. The vein in places has a width of 30 ft., averaging $5 per ton. George Shelby has cut a shoot of ore in his mine near Nevada City, a mill test yielding $40 per ton.

Nevada City, Jan. 7.

PLACER COUNTY.

The Northern California Mines Co., a corporation composed of Pittsburg men, owning the old Osborn mine near Westville, has completed a tunnel 1,400 ft. long, and drifts have been run each way on the vein from the end of this tunnel. This work has proved that the lode averages six feet wide and that the ore is of a good milling grade. A force of 25 men is at work in the mine, and will continue throughout the winter. The Joshua Hendy Co. is building a 40-stamp mill on the ground, which will be run by electric power generated on the Middle Fork of the American river. It is the plan of the company to increase the mill to 100 stamps within a year.

COLORADO.

BOULDER COUNTY.

The old workings of the Golden Age mine, near Jamestown, are being cleaned out. I. V. Sybrant is superintendent. The ore now on the dump and blocked out in the workings will be treated at Springdale. The tunnel of the U. S. Gold Corporation on Sugar Loaf Mtn. is in 1,200 ft. ——The Annuity Co. is erecting a new mill at the Dolly Varden mine near Sunset.——The Denver Tunnel Co. will resume work on its property at once.

CLEAR CREEK COUNTY.

The new schedule of rates on lead, zinc, and copper ores is expected to affect favorably the mining industry in this county. The average advance in the price of lead ore will vary from $2.50 to $5 per ton, according to the grade of the ore, while there is an increase over present prices of zinc, buyers giving a premium of $3.20 per ton on all ores carrying over 40% zinc. The advance in copper rates is from $1 to $2 per unit, according to the value of the ore. This new schedule is expected to have the effect of opening some of low-grade mines that have been idle for years.

OURAY COUNTY.

One of the most important strikes made recently in the Ouray district occurred in the Jonathan, just north of Ouray and almost within the city limits. The find was made by the lessees, John Wall and Chas. Swope, who are said to have taken out $60,000 from the pocket. The ore runs in car lots from $1,000 to $2,000 per ton. The discovery was made in the lower level, and only a short distance from where the present lessees commenced work.

SUMMIT COUNTY.

(Special Correspondence).—Owing to increased production, Summit county is beginning to receive more attention, and with its mines of gold, silver, lead, zinc, iron, copper, and bismuth, its water supply, its abundance of timber, and other natural advantages, it is now attracting the notice of mining men, as well as of the Eastern capitalists looking for investment. The consolidation of holdings and interests is an important feature of the past year. The Jessie Gold Mines Co. has been organized by James T. Hogan, after working the Jessie mines and mill on a bond and lease for over a year. The Jessie, Diana, and Florence groups, which comprise about 500 acres, are consolidated in this organization, which is incorporated for $1,500,000 in shares of $1 each. The property has been favorably reported on by David H. Lawrance, and the ores tested by Mr. Knappe cyanide expert, also of Denver. It is the intention of the new company to install a mill of 400 or 500 tons daily capacity, with a subsidiary cyanide plant for treating the tailing. ——The Colorado Consolidated Dredging Co. has taken over the placer ground of the old American Gold Dredging Co. on the Swan and Blue rivers. This company is going to commence the construction of new dredges, and with the two old ones put in order and brought up to date with modern improvements, it will have a plant capable of handling several thousand yards of gravel per day.——The Wellington Mines Co. is a consolidation of the Wellington, Oro, and Orthodox properties. Last week it was reported that a new vein of gold-bearing carbonate ore had been discovered. In prospecting the surface the superintendent, Peter L. Cummings, uncovered this vein 150 ft. from the point of original discovery. It varies in width from two to four feet and contains a streak six to ten inches wide that is well charged with gold. The cross-cut being driven to intercept this vein from the adit is entering a mineralized zone. Development of the zinc-lead shoots has been proceeding steadily and plenty of ore is ready for shipment. Finishing touches are being given to the new track, ore bins, chutes, and automatic dumper, which are to make easy the intended shipment of three carloads per day.

Breckenridge, Colo., Jan. 4.

IDAHO.

ADA COUNTY.

(Special Correspondence).—The property of the Big Giant Gold Mining Co., 10 miles northeast from Boise, has 4,450 ft. of development work, the greater part of which was accomplished within 1906. This work is said to have exposed orebodies of sufficient size and value to justify the erection of a 200-ton mill, and preliminary steps are being taken for the construction of such a plant. The ores consist of quartz, carrying free gold. Orville E. Jackson, of Boise, president of the company, hopes to have the mill in operation by August.

Boise City, Jan. 7.

BOISE COUNTY.

The Nellie mine, owned by the American Exploration Co., situated on the Payette river, near Horseshoe Bend, has driven 1,600 ft. on a cross-cut adit, which is expected soon to cut the vein at a depth of 850 ft. The lode for which they have been driving has been well opened to considerable depth on the Kentuck, which end-lines with the Nellie. Work has been in progress upon the Nellie for two years, and M. E. Hopkins, manager, states that the company has expended $45,000 in equipment and development.——The Kentuck mine, belonging to the United Mines Co., is having thorough tests made with a view to improving its milling method, which hitherto has been concentration.

The Golden Treasure Placer Co. contemplates installing hydraulic elevators next season for work on Payette river, 15 miles above Garden Valley.—The Gold Coin Co. has installed a 30-ton mill at their mine near Idaho City. It is equipped for amalgamating and concentrating. The mine has been opened by an incline shaft 164 ft. on the dip of the vein, with some driving on various levels. The vein has an average width of four feet, the ore being a free-milling quartz with considerable sulphide. J. H. Emery of Idaho City is president of the company and superintendent of the mine.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—On the Mohawk, the Hays Monnette lease, which will have terminated when this letter appears in print, is taking out ore at the rate of $30,000 per day, and other leases on the same mine are taking out their quota. Properties near at hand and at the most remote corners of the district are working feverishly. Three or four leases on the Kewanas are in high-grade ore, which is being sacked preparatory to shipment. Sacks of rich ore are piled on the dumps of the leases on the Night Hawk claim, and the Grandma is the scene of much activity. On the August claim, several lessees are busy, and two or three of the workings are in ore. On the Simmerone claim, adjoining the Blue Bull, the Simmerone Mining & Leasing Co. has been formed, and is sinking a shaft to catch the orebodies that have been opened on that ground. At present the shaft has reached a depth of 90 ft., and three veins have been cut, all carrying good milling ore. It is the intention of the company to sink to 200 ft. before cross-cutting or driving. A head-frame has been erected above the shaft, and a gasoline hoist will soon be on the ground. The Simmerone claim will be remembered as one of the leading strikes of the camp in the early days, when rich ore was carried across the desert to Tonopah under armed guards. A high fence was built around the claim to prevent stealing. An important deal was recently consummated, by which the Homer Wilson Trust Co. came into possession of the Crestone and Whale claims, a short distance east of the Dixie, and adjoining the Nightingale group. Several strong veins traverse the property, from which good assays have been obtained.

This part of the Goldfield district, north to Diamondfield, is the scene of great activity, and nearly as many men are working on the different properties as on the producers nearer town. On the Goldfield Somerset property, several men are exploring a 12-ft. vein recently uncovered, that returns $15 in gold from the grass roots. On the Bonanza claim of the Goldfield Madonna, a vein about 5 ft. wide was encountered at a depth of 40 ft. that assays well. A hoist is being erected on this property, and work will be continued systematically. On the Aurora claim, a short distance south of Diamondfield, the workings are in high-grade milling ore. Several veins have been opened on this property. The same may be said of the Freedom claim, adjoining the Aurora. Several strong veins traverse this property, and in sinking the company shaft to its present depth of 100 ft., three or four streaks were crossed, all carrying pay-ore. It is the intention of the United Tonopah & Goldfield Mines Co., which own the Freedom claim, to cross-cut to these various veins at depth. In and around Diamondfield, development work is being carried on with feverish haste to open the orebodies already disclosed on the Daisy, Jumbo Extension, Great Bend, Quartzite, Black Butte, and others. All these prospects are in high-grade ore.

Word has been received from the Selby smelter, near San Francisco, that 50 tons of ore shipped from the Hays-Monnette lease on the Mohawk this week returned $700,000. The Frances-Mohawk shipped 25 tons that returned $250,000. This is an unprecedented record.

A letter from Wallace MacGregor, consulting engineer of the Nevada Condors, of Fairview, and the Joe Wonder Mining Co., of Wonder, states that mining operations in these two camps are assuming large proportions, and many companies have found ore since his last visit to the district a month ago. The showing on the Nevada Condors is exceedingly encouraging. In the present workings the vein has widened, and the character of ore has improved. All ore taken from the Nevada Condors is of good milling value, while some of it is high-grade stuff. This prospect lies in the heart of the rich Fairview district, and from present indications should soon become an active producer.

Every stage into Wonder is crowded to the guards. People are entering the new fields from all parts of the State, and it is predicted that in three months Wonder will have a population equal to any camp in Nevada, outside of Goldfield and Tonopah.

New strikes are reported daily, and important mining deals involving large sums of money are being made. Big prices are being paid for favorably located claims, and the pioneers of the district are assured of having their camp thoroughly developed. No less than 40 properties are in high-grade ore. The Nevada Wonder is the most prominent. This company is sacking $1,000 ore preparatory to shipment. The Jack Pot is another producer of high-grade ore. The June Wonder, Daisy Wonder, Joe Wonder, Lucky Strike, and many others are looking well.

Goldfield, Jan. 8.

Later advices state that on January 9 the Miners' Union held a meeting to consider the proposition of the mine operators, which named $5 per day for miners and skilled help, and $4.50 for laborers. The total number of votes cast was about 1,700, or one-half of the total membership of the Union. It is understood that the majority of voters favored the proposition, and that the strike is over, in which case all the mines will open within a few days. In view of this change, the stock market is showing increased activity.

LINCOLN COUNTY.

(Special Correspondence).—In driving on the vein on the 150-ft. level of the Searchlight-Treasurer mine, a rich streak of ore was encountered; it is similar to that found on the New Year's Gift mine of the Duplex Co., not over 1,000 ft. distant. The strike is one of the most important yet made, and the mine being right in town, the owners have purchased the mineral rights under the townsite itself.—— Work has been resumed on the property of the Searchlight-Belle Co. Several strikes were made recently in the immediate vicinity of this property on the Colorado, Wyoming-Searchlight, Santa Barbara-Searchlight, and Golden Rod.

Searchlight, Jan. 8.

BRITISH COLUMBIA.

The Rossland mines have produced well during the past year, and some important strikes have been made. The total output for 1906 was 277,361 tons, with an estimated value of $3,338,332. This is a lower tonnage and value than the preceding year, in fact it is the lowest since 1899, but the camp is in good shape and a prosperous new year is expected.

Le Roi mine leads with a record of 126,396 tons, closely followed by the Centre Star, with 114,500 tons. Le Roi No. 2 has shipped 21,000 tons and milled 10,500, and the White Bear milled 1,350 and shipped 570 tons. The other producers were the Jumbo, Mabel, Crown Point, and O. K. mines.—— The Centre Star consolidation includes the War Eagle, Centre Star, Pilgrim, Mugwump, and Red Mountain, and the recently purchased Idaho and Iron Mask. Much diamond-drilling has been done from the lower levels, and the vein has been proved to a depth of over 1,200 ft. The Centre Star main shaft is down 2,000 ft. W. H. Aldridge is general manager for the company, M. E. Purcell is the superintendent, and R. H. Stewart the chief engineer.——Le Roi has a winze down 400 ft. below the 1,350 level, and the main five-compartment shaft is down to the 1,460 level, and is being extended by contract work. There are 325 men employed.——Le Roi No. 2 has done 3,053 ft. of development work during the year, and 5,091 ft. of diamond-drilling. The ore shipments, amounting to 21,000 tons, have averaged about $24 gross value, and the 10,500 tons milled at the concentrator ran $3.50 per ton, and produced concentrate worth about $30 per ton.—— The White Bear has done 350 ft. of drifting and 150 ft. of cross-cutting during the year, with 500 ft. of diamond-drilling. Much of the work has been done on the 1,000-ft. level.

The Trail works of the Consolidated Co. now has a capacity of from 1,500 to 1,800 tons of ore per day. A new copper-blast furnace has been added, making five now in operation. The lead furnaces have a capacity equal to 75 tons of metallic lead per day. The Huntington Heberlein process of roasting has proved successful, and six more converters have been added. The capacity of the refinery has been increased to 75 tons per day. The number of men employed has averaged 550, the copper furnaces have treated 240,000 tons, and the lead furnaces 17,500 tons during the past year, although they were closed down for several months for repairs. The Northport smelter has a capacity of 1,200 tons daily, and has recently resumed operations after a long shut-down.

Personal.

WM. M. BREWER is at Los Angeles.

W. P. HAMMON is on his way to New York.

JAMES W. NEILL was in San Francisco during the week.

ROBERT T. HILL is examining mines in Beaver county, Utah.

THEODORE DWIGHT has returned to New York from Mexico.

WHEELER S. BISHOP, lately in Oregon, has gone to El Oro, Mexico.

OLIVER P. POSEY, of Los Angeles, has been to San Francisco on a visit.

THOMAS EDWARDS has been visiting the mines of Kalgoorlie, Western Australia.

ALEXANDER HILL & STEWART have moved their offices to 4 Broad St. Place, London.

JOHN C. GARVIN is the new superintendent of the Tonopah-Rambler mine, in Nevada.

SCOTT TURNER has become assistant to the editor of the MINING AND SCIENTIFIC PRESS.

W. A. SWART has been elected president of the Western Association of Technical Chemists.

JOHN A. REID, of Stockton, Cal., has been examining copper mines at Yerington, Nevada.

GEO. W. BOGGS, of Baker City, Ore., will spend his time at Tuscarora and Goldfield, Nev., this year.

FRANK H. PROBERT visited San Francisco on his way to examine mines near Greenwater, California.

H. W. EDWARDS and A. B. BRYANT have formed a partnership, with offices at Silver City, N. M., and at Denver.

A. W. MCCUNE has resigned as president of the Cerro de Pasco Mining Co. and will return to Salt Lake City from Peru.

F. H. MINARD, who lately returned to Denver from Central America, is now examining mines in Arizona and Mexico

JOHN D. IRVING has been appointed professor of economic geology at Yale University. He is the editor of *Economic Geology*.

THOMAS T. READ has been placed in charge of the Department of Mining and Metallurgy in Colorado College, at Colorado Springs.

THOS. C. BURKE, of the Canyon Creek Mining Co., operating near Baker City, Ore., attended the inauguration of his brother as Governor of North Dakota, on January 8.

FRANK ROBBINS has taken over the management of the property of the Pacific Nitrate Syndicate in Death Valley. He will continue to make Los Angeles his headquarters but will divide his time between his consulting practice and the administration of the company mentioned.

THEODORE J. HOOVER has just completed an examination of the ancient lead-silver mines in the Calbeck Fells, Cumberland, in the north of England. These mines were first worked in 1050 and there was at one time a mint at Carlisle, where the silver, obtained from the mines near by, was coined.

Publications Received.

From the U. S. GEOLOGICAL SURVEY: 'The Yukon-Tanana Region, Alaska', a description of Circle Quadrangle, by L. M. Prindle. Being Bulletin No. 295, with several useful maps

UNITED STATES GEOLOGICAL SURVEY. I. Bald Mountain-Dayton Folio, Wyoming. 2. 'Geology and Ore Deposits of the Cripple Creek District, Colorado,' by Waldemar Lindgren and Frederick Leslie Ransome, being Professional Paper No. 54. This is a monograph of 500 pages, giving a summary of the previous reports on Cripple Creek, together with much new material. It is handsomely illustrated and represents the sort of work in the doing of which the Survey has no equal.

Mineral Output of British Columbia in 1906.

To the editor of the *British Columbia Mining Record*, we are indebted for the following statistical data, covering the mineral output of the Province in 1906:

Gold, placer	46,000 oz	$920,000
" lode	250,000 "	5,150,000
Total	296,000 oz.	$6,070,000
Silver	3,470,000 @ 63.5 cents	2,203,000
Copper	45,000,000 lb. @ 19.3 "	8,685,000
Lead	53,000,000 lb. @ 5.08 "	2,693,000
Zinc (approximated)		50.000
Total		$19,701,000
Coal	1,530,000 tons of 2,240 lb. @ $3	$4,590,000
Coke	210,000 " " " " @ $5	1,050,000
Miscellaneous, including building materials		1,000,000
Total non-metalliferous		$6,640,000
Total value of mineral production		$26,341,000

Dividends.

ON January 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 112 of $180,000. This makes the total amount of dividends paid to date $8,046,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, January 10.

Argonaut	$4.80	Furnace Creek	$5.50
Con. Virginia	1.20	Savage	0.90
Mexican	1.03	Sierra Nevada	0.73
Ophir	3.03	Yellow Jacket	1.28
Belmont	5.37	Montana	3.95
Jim Butler	1.30	Mohawk	16.75
Jumbo	4.25	Red Top	4.25
Jumping Jack	0.30	Sandstorm	0.71
Manhattan Con	0.98	Silver Pick	1.47
Midway	2.25	Tonopah Ex	5.87

METAL PRICES.

By wire from New York.

	Average prices for week ending January 3.	Average prices for week ending January 10.
Copper—Lake (cents per lb)	23.85@24.10	24⅜ @24.79
" Electrolytic "	23.30@23.80	23⅞ @24.17
" Casting "	23 @23¼	23½ @24
Lead "	6	6
Spelter "	6.71	6.70 @ 6.75
Silver (cents per oz.)	69⅞	69½

ANGLO-AMERICAN SHARES.

Cabled from London.

	January 3. £ s. d.	January 10. £ s. d.
Camp Bird	1 8 6	1 8 6
El Oro	1 6 9	1 6 3
Esperanza	2 14 6	2 16 3
Dolores	1 7 6	1 5 6
Oroville Dredging	1 0 6	1 0 6
Stratton's Independence	0 3 3	0 3 6
Tomboy	1 12 0	2 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Jan. 3.	Jan. 10.
Bingham Central	2	2
Boston Copper	32⅞	31½
Calumet & Arizona	177	179
Cumberland Ely	12⅝	13
Dolores	7¾	7¾
El Rayo	6⅞	7
Guanajuato Con	4⅜	5⅜
Giroux Con	9⅞	10¼
Greene Con	32⅛	31¼
Nevada Con	18	19¼
Nipissing	13½	14
Tennessee Copper	48¾	55
Tonopah Ex	5¾	5¼
Tonopah-Belmont	5 ½	5¾
Tonopah	19⅞	19
United Copper	73¾	74⅜
Utah Copper	33¼	37½

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE work done by lessees is applicable to the annual assessment work required to be done on mining claims.

THE by-products obtained by the London, Gas, Light & Coke Co. are said to be worth $8.16 per 2,240 lb. of coal treated.

EACH 30 lb. of water evaporated into steam of 70 lb. pressure constitute one boiler horse-power; therefore when 15 lb. coal are consumed per hour on each square foot of grate, and each pound of fuel evaporates 7 lb. of water, 2½ h.p. is being produced per square foot of grate.

THERE is no doubt many abandoned mines would be working today if a competent engineer had been consulted with regard to the most suitable machinery required, instead of the matter being left in the hands of a superintendent who knew absolutely nothing of engineering principles.

IN building foundations the main objects in view are: (1) To form an unyielding bed for the support of the machinery. (2) To absorb vibration. (3) To resist the pull when power is transmitted beyond the base of the engine, as is the case in pumping, winding, and driving by ropes and belts.

THE available power of a waterfall is estimated by two factors, weight and fall, multiplied together; so the electric current is measured by volts multiplied by amperes, the resulting figures being termed watts. The watt is therefore a measure of electric power, and 746 of them are equal to an indicated horse-power.

WHEN temporary arrangements are being constructed around a new shaft, it is well to employ some foresight with regard to the permanent plant. The temporary gear can be fixed to one side, thus making it an easy matter to build the permanent works around the temporary without having to suspend operations in the shaft.

IN PRODUCING heat for power purposes, combustion proceeds at a medium pace and the oxygen is caused to combine with fuels which are valuable as heat producers in proportion to the hydrogen and carbon they contain. Hydrogen is three to four times as powerful an agent as carbon, hence the value of hydro-carbons, or mineral oils, as heat producers.

THE Land Department has held that the pendency of an adverse suit excuses for the time being the performance of annual labor. The Courts have not as yet passed upon the question. The ruling of the Land Department may be upheld as between the litigation parties, but there might be danger from re-location by outside parties disconnected with the litigation. It would be prudent to perform the work, or at least make a *bona fide* attempt to perform it. If the attempt is frustrated by acts, or threatened acts of violence, performance would be excused.

ONE horse-power is constantly lost in 152 ft. of naked 2-in. pipe, in 86 ft. of 4-in. pipe, and in 53 ft. of 6-in. pipe. When these pipes are covered with two inches of non-conducting composition, it requires over 1,150 ft. of 2-in. pipe to lose a horse-power, 750 ft. of 4 in., and 500 ft. of 6-in. pipe. Steam, therefore, needs as careful insulation as electricity. It is not a suitable means for power transmission to a distance, but should be used as near as possible to the boiler, the pipes and passages being kept short, as some loss is inevitable, no matter how well clothed they may be.

THE duty of the boiler is to transmit heat to the water within. This transmission is effected more quickly through thin walls than through thick, hence the quick steaming of those boilers whose tubes are thin and small in diameter. Heat is transmitted to the water in actual contact with the fire-tubes, but water itself is a poor conductor and does not readily disseminate the heat it receives; thus the heating of the contents of the boiler is effected largely by circulation, or movement of heated water upward and colder water downward. Boilers with slow circulation are slow heat transmitters and slow steam producers. A boiler evaporating 9¾ lb. water per pound of coal is utilizing about 75% of the heat produced, while many triple-expansion engines yield an indicated horse-power on from 12 to 20 lb. evaporated water per hour.

STEAM is defined as "an elastic invisible gas, generated from water by the application of heat." Water at sea-level boils at 212° F., and cannot be made hotter in an open vessel at that level; in a closed vessel, however, the temperature of the water varies with the steam pressure. There is a great difference between the heat required to boil water and that necessary to turn it into steam, no less than 966° F. being used in the change of form which the water undergoes, this amount being known as the latent heat of steam. But for this fact the change would be instantaneous and the whole of the water pass away as steam directly boiling point was reached; this is not the case, the change is gradual, and in accordance with the heat added. The heat required to evaporate one pound of water is sufficient to melt 13 lb. of gold.

A DYNAMO in its simplest form consists of a pair of magnets, and a number of conductors which cut or interrupt the lines of attraction between these magnets. In practice, the conductors would be bound together into a revolving armature, while the magnets are wound with wire to increase their attractive power. The current in the armature is collected by brushes, and may be of two different kinds. In the course of every revolution each conductor will cut the field between the magnets in two opposite directions, upward and downward. If the current generated in each direction is collected separately, the result is an alternating current. On the other hand, by collecting the current through a commutator formed of insulated bars, the brushes can be arranged to take up current in one direction only, and be insulated or out of gear when the conductor is moving in the opposite direction; the result in this case is a continuous or direct current.

A MINING CONCESSION in the Federated Malay States gives rights to the extraction of any metal or mineral found on or under the surface of the ground, and to install the necessary machinery for preparing the mineral for the market; the use of the needed land on which to erect houses for the miners, workshops, etc., and also of agricultural land for the cultivation of vegetables and plants necessary for feeding coolies; the exclusive use within the limits of the concession of all the products of the soil such as wood for building and for fuel, rattan, etc., provided same be used for the needs of the concession. All concessions must be thoroughly developed within six months after their grant and titles are valid for 25 years. It is thus impossible to retain a concession without working it, and the restriction is made with the sole object of preventing mining-land speculation.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Standardization of Screens.

The Editor:

Sir—I am much interested in your effort to make people describe screens by the size of the hole instead of by the mesh. The use of meshes is a most trying and misleading method of description that could possibly be imagined. For example, referring to Mr. Argall's convenient table of Tyler's screens, a 12-mesh sieve may have holes ranging from 1.0744 to 1.7602 mm. in width or anywhere between, according to the size of the wire that is used. Fancy trying to sell land that had been measured by a tape that would vary from 1 to 1¾ ft. for every foot that was measured. How impossible would be the transaction. How easy would it be for the seller to give short measure. How difficult it would be for the registry of deeds to make a record that any one could again check up for later transactions.

Now, the user of the word 'mesh' thinks that these are little grains of sand and that the differences don't amount to anything, but think of the perplexity that I am in when I receive data for computing a classifier, as I am constantly doing, that are given to me in meshes instead of exact width of holes. Referring to my table of velocities, a grain of quartz 1 mm. wide settles 93 mm. per second, while a grain 1¾ mm. wide settles at the rate of 140 mm. per second. If I calculate my classifier for 140 mm. per second, and then it is fed with quartz that settles in 93 mm. per second, my classifier will be completely out of gear with the work it has to do. I am obliged to take a mean figure and hope that this will come somewhere near right instead of being given an exact figure with which I can work with precision.

ROBERT H. RICHARDS.

Boston, December 27.

The Greenwater District.

The Editor:

Sir—I had been reading for some time marvelous stories of the great wealth of Greenwater, and I had seen the statement made in many places that it was going to be the "greatest copper camp in America," that the showing in rich copper was very extensive in area, and that the ore was extremely rich. I had come to believe that all this was true, and I felt for some time a desire to get to Greenwater and try to get in on some of this wonderful possibility. Such was my motive in going.

There are two routes from Los Angeles to Greenwater; one by the Santa Fe railroad and the Tonopah & Tidewater (or Borax Smith) railroad, and the other by the Clark road (the Salt Lake route). I went by the Santa Fe. The T. & T. R. R. crosses the Santa Fe at Ludlow, 195 miles from Los Angeles. From there to Dumont, which is the front, is 75 miles. The fare from Los Angeles to Dumont is $10.60.

At Dumont I took the stage for Greenwater, paying $10, which is to be raised to $15. Leaving Los Angeles on Thursday night at 8 o'clock we reached Dumont on Friday morning at 9 o'clock, and the old borax station, 17 miles out, at 4 P. M. There we spent the night, having comfortable beds. Saturday at 3 P. M. we reached Ramsey, 33 miles from the borax station and exactly 50 miles from Dumont. This distance I believe to be accurate, although the stage company attempts to make it longer.

Coming out, I left Ramsey at 6:30 A. M., reaching Amargosa on the Las Vegas & Tonopah railroad at 3:30 P. M., the distance from Ramsey being 48 miles, or possibly 49 miles. At Amargosa I had to remain until 11:30 A. M. the following day, and I could have reached Los Angeles the second morning at 8 o'clock. From Los Angeles by the Clark road one leaves at 8 P. M. (say, Monday), and reaches Ramsey at 1:30 P. M. Wednesday. The fare on the stage from Amargosa to Ramsey is $16, and on the railroad from Los Angeles to Amargosa it is $18.15. One has to stay over night at a stage station by either route. The stages are covered wagons, and the rate of progress is painfully slow, they are generally very much congested with animate and inanimate freight of all kinds. The stage from Dumont at present runs every other day, while from Amargosa it runs daily.

Ramsey is now claiming the title of 'Greenwater', which title has until recently been claimed by Kunze, three miles farther from the railroad. The post-office at present is at Kunze, but it is soon to be moved to Ramsey, which is known as 'Greenwater.' The altitude of Ramsey is about 4,300 ft. above sea-level and Kunze is about 4,800. About two miles beyond Kunze is the settlement of Furnace, which is where the men live who work in the Furnace Creek (the Patsey Clark) properties.

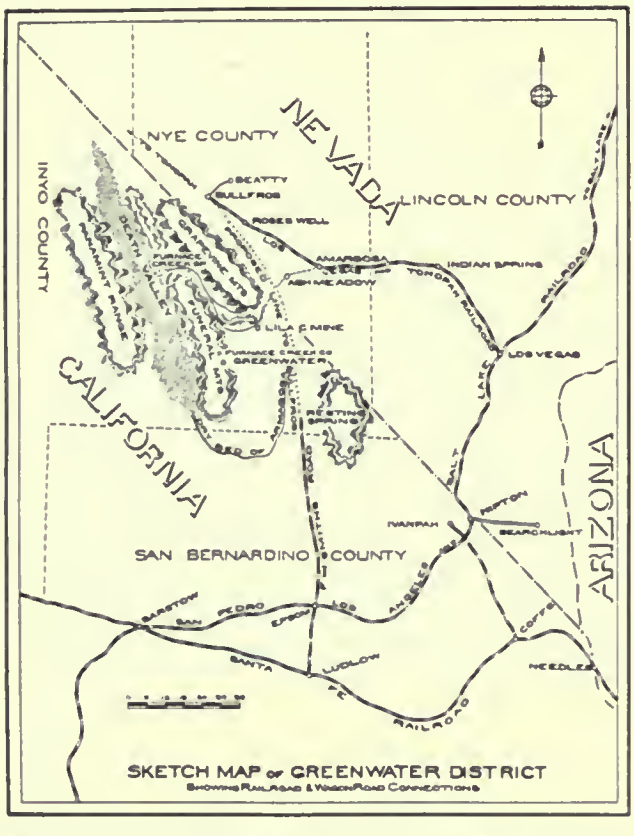
At Ramsey lumber sells for $140 per thousand feet, while flooring costs $175. Water sells for $7 to $10 per barrel, and hay at $100 per ton, coal the same, and other things in proportion. The lodging houses are of canvas and no attempt is made to heat them. Miners in shaft-work get $3.50 per day and board; a two-horse team and driver command $12.50 per day.

I was admitted to the shaft of the Red Boy, 75 ft. deep, and might have gone down the Saratoga, somewhat shallower, had I so desired, but the two are under the same management and I was assured that both were alike, so far as showing went. This showing consisted of a narrow seam of silicious material, carrying some green stains. At the bottom of the shaft there were slips running in all directions and each seemed to carry in places green-stained material about an inch wide. I was not admitted to any other property, nor is it the custom of the district to let strangers see what they have (or have not) got. The Schwab property, purchased from the locators Arthur Kunze and others, is situated on the trail between Ramsey and Kunze. Work seemed to be in progress on three of these locations. At one a gasoline hoist (50 h.p.) was at work and on another one is being erected. These shafts are commonly reported to be over 100 ft. deep, but the exact facts I could not learn. At one of these I saw the vein exposed for a width of perhaps 30 inches. It abounded in green stains, and carried some malachite and a little azurite. The rest might have been chrysocolla. On the dump at this and the Furnace Creek properties a little green-stained material has been collected in separate piles, perhaps a couple of cars of 20 tons each at each dump. This is a generous estimate.

I saw no pyrite anywhere nor could I learn from assayers, or any one else, of the occurrence of any. I did see a minute piece of bornite, said to have come from Willow creek, about fifteen miles from Ramsey. It is my estimate, from what I saw and could learn, that all the properties in the entire Greenwater district, from material thus far taken out, could not contribute together one car (twenty tons) of ore that would run 25%, and that if the stained material now assembled on the various dumps were to be assayed, it would scarcely average 5%. Not a shipment of any size for commercial purposes has been made from the entire district, as far as I could learn, the only so-called 'shipments' being a few burro-loads of samples to beguile speculators.

The Furnace Creek range, in which these deposits occur, appeared to me to be composed wholly of erup-

tive rocks, rhyolite in various stages of alteration. As nearly as I could learn from what I saw the supposed great veins of the Greenwater district are zones of fracturing of considerable width. I saw none of these zones that was less than 30 ft. wide and in many places I thought them much wider, but the true test must be secured from underground developments. Through the seams in this zone the hot waters circulated and effected a large amount of replacement, the material being much silicified, and more or less impregnated with copper and iron. Everywhere they are highly stained with iron oxide and are locally called 'gossan.' I saw no gossan that was the residuum from pyrite, although I looked for it in many places. The iron that has produced these extensive stains was doubtless originally associated with the very small amounts of copper, which, after oxidation, yielded the carbonates and stained the rock green. I tried diligently to learn of any enrichment by gold and silver in the so-called 'gossan' and near the surface of these veins, but while the assayer at Ramsey



said that some of the samples that he had assayed yielded a little gold and silver, it was clear to me that no gold or silver ore of commercial value had been found.

There are probably less than a thousand men scattered through the district. Many of these do not hesitate to express the feeling that it is high time that some discovery should be made of ores of commercial value if the camp is to justify the extravagant claims that have been published regarding it.

It is my impression that the Las Vegas & Tonopah railroad will be extended from Amargosa toward Greenwater such distance as may be requisite to command the traffic. This can be done cheaply and would be a great tonic to the camp in many ways. Much prospecting is going to be done in the hope that discoveries will follow deeper exploration. There is no guide to indicate at what depth water will be struck in any of the workings, disclosing the pyrite that it is fondly hoped to find below the water-level. I learned of no springs along the easterly base of the Funeral range. On the westerly side (the Death Valley slope), I understand that water does occur, but how far above sea-level I do not know. It was impossible for me to go over there without fitting out an expedition to carry food, water, bedding, etc., and even then I should have required the services of a guide.

To illustrate the expansive tendencies of the Greenwater boom, I may relate the following incident concerning one of the properties now offered to an eager public, with reckless display of printer's ink and glittering word pictures of wealth in store for the fortunate investor who comes in upon the ground-floor. I met the prospector that located and sold this property to the promoters, one of whom is a prominent mining man. The price paid the prospector was one thousand dollars and a small block of stock. This property is now capitalized at $1,500,000 in shares of one dollar. It was put on the market at 50 cents per share.

JAMES W. ABBOTT.

Pioche, Nevada, December 12.

The California Miners Association.

The Editor:

Sir—In your comments on the recent annual convention of the California Miners Association you remark that "the California miners were not there;" and that "the attendance was restricted largely to the little coterie that has been keeping the Association alive during the past few years." It may be said that these remarks have given some offense to those who have been earnest in their endeavors to maintain the institution and who have been compelled from force of circumstances to take the lead in its affairs. A circle of persons who meet habitually for any purpose must have some among them who are more earnest than others, and more constant in attendance, and their names naturally become more prominent in the public accounts of the meetings than those who do little actively. Yet this cannot be to their discredit, if the object be a good one. As one of the original organizers of the California Miners Association and a member of the executive and other committees for a dozen years, long association with these gentlemen has convinced one that they are unselfish and have no ulterior motives other than the general benefit of the mining industry and the miners engaged in it. Not having personally attended the last convention—or indeed several preceding it—and not being an officer, I may say this with better grace than any of those who are now more active in the Association.

It is perhaps unfortunate for the general advancement of the Association that the idea is prevalent that its main object continues to be the rehabilitation of hydraulic mining. This was its original purpose and continued so for several years, until the passage of the Caminetti law. Since then it has been devoted to the benefit of mining generally. The quartz and drift miners have had no grievances to take up; and the dredging men have an association of their own, having affiliated only to a slight degree with the California Miners Association, and giving it no active support. The petroleum men have also their own organization. The hydraulic miners themselves, what few there are, have not for several years taken any active part in the deliberations, and have contributed little or no funds. Until the court of last resort passes on pending questions connected with this industry, it is—as you say—a dead issue. Last year all the hydraulic mines of the State only yielded $975,000 in gold. Of this total $635,669 came from the counties of Del Norte, Humboldt, Siskiyou, and Trinity, all of which drain into the non-navigable streams emptying into the Pacific ocean, where there are no legal restrictions against hydraulic mining. This only leaves $339,471 as coming from the counties in the drainage basins of the Sacramento and San Joaquin rivers, where the Caminetti law is in force and where the California Debris Commission has jurisdiction. If the issue is not dead the hydraulic mines

virtually are, judging by this small showing for a whole year for what was at one time an industry supposed to yield eight or ten millions annually. The industry as a whole is decreasing in importance each year. In fact the dredging machines in California are now yielding annually $460,000 more than the hydraulic, drift, and surface placers of the State combined, and will shortly yield a million dollars more.

It may be confessed that the proceedings of the convention at Nevada City a year ago were largely devoted to consideration of hydraulic mining interests. Possibly it was for this reason that few of the prominent local quartz miners took any active part in the deliberations. The men connected with the management of the Association are endeavoring to excite a more general interest in its affairs, so that the organization may be maintained on broader lines than originally designated. If the drift and quartz miners need no protective legislation just at present, they may need it at some time. Both the dredge and copper miners have certain annoyances to contend with even now and these may become serious. Without some organization little can be effected as was proved in the case of the hydraulic miners, many of whom fought single-handed for years to defend what they considered their rights. It was only when the California Miners Association was formed that either the State or Federal Government took any notice of their demand.

I think the California Miners Association is worthy of the support of the whole mining community of the State if only for the moral effect it affords to the industry, and the fact that in accordance with modern practice the class of persons it represents are organized for mutual benefit and protection. That some self-seeking persons may have used it for political advancement or notoriety is no argument against its existence. The better class is far in the ascendant in its councils. Let more men of prominence in the industry give their names and support, as they should do, and it will prosper. The miners themselves ought to maintain it, by which I mean the owners, superintendents, managers, engineers, etc. The ordinary working miners will not furnish funds for anything of this sort, as experience has proved. Nor should the Association be compelled to ask financial support from mining machinery men, as it has had to do, and is doing. In fact most of the available funds are from this source. I personally know that most of these gentlemen would rather see the actual miners themselves take hold of the organization, manage and maintain it. It has been a sort of semi-compulsion which has led many of them to take any active part in the affairs.

As to publication of papers in the official proceedings only, I quite agree with you that they should be given at once to the press as soon as read and not delayed until apt to be 'stale.' But the present method has been forced upon the Association by the necessity of publishing regular proceedings for subscribing members and getting some profit, through advertisements, at the same time. All this by reason of lack of funds.

The new president is an active young man long identified prominently with the mining interests. He has pounded the drill, put in timbers, dug and tended ditch, and worked in gravel and quartz mines, as miner, foreman, superintendent, and manager. He has been connected with the Association since its beginning, and indeed has once before presided over its deliberations, and knows its weak points and its necessities. Let us trust that he will be able to inaugurate a broader spirit and policy and induce prominent men to join in the good work. He can do nothing alone. All in any way interested in the varied mining industries of the State should lend a helping hand. With more active workers to choose from there can be no further intimation from any source that a few men only are 'running' the organization and for one interest alone.

CHARLES G. YALE.

San Francisco, December 28.

The Moore and Butters Filters.

The Editor:

Sir—The article by Mr. Nutter on the Moore filter in your issue of December 15 is both interesting and instructive. There are, however, several serious errors in it which do an injustice to the Butters filter, and which should be corrected immediately. In discussing a plant to treat 350 tons of slime, as described by Mr. Nutter, a comparison with the plant erected (at Millers, in Nevada), for the Tonopah company, will be in order. This Butters slime-filter consists of 216 leaves, and would handle about 300 tons of the Liberty Bell slime, and 250 leaves would easily handle the mill output of 350 tons per day. Such a plant would require, instead of eight 7-in. pumps as estimated by Mr. Nutter, only one pump that would transfer the pulp or water in ten minutes. It is very difficult to calculate centrifugal pump capacities working on a material of such variable consistency as slime, but judging from previous experience with different slimes a 9-in. pump would be amply large; and as 48-in. pumps are regularly used to transfer sand in dredging, it is hardly in order to call a 9-in. pump "large," or to consider it or its valves difficult of operation.

The light crane mentioned by Mr. Nutter would not be necessary, as a half-ton chain-block, with crawl, would handle the Butters leaves when such handling became necessary, which, by the way, would be rare.

As regards the quantity of slime to be pumped, it is certainly not fair to require the handling of the large quantity needed to fill Mr. Nutter's filter-vats, which are not designed as is the Butters filter-box, to contain barely enough slime to cover the leaves. Neither is it a fair proposition to require that the slime be pumped against the maximum head of 19 ft., when a properly designed plant, even when built on level ground, has a maximum lift of 10 ft. and a minimum of 0 ft. In other words, one properly designed box for 250 Butters leaves will contain approximately 7,000 cu. ft. instead of the 24,000 cu. ft. capacity of the eight filter-vats that Mr. Nutter considers necessary. The use of such a box would make available for water and slime storage the vats now used for filtering and washing, thus obviating the necessity of installing the two storage tanks he mentions.

Instead of the time items being as given by Mr. Nutter in the cycle of operations, the following in the opinion of the writer, would more nearly approximate actual running conditions:

Operations.	Moore.	Butters.	Butters gravity.
Loading	1 hr.	1 hr.	1 hr.
Transferring (filters)	10 min. (pulp)	10 min.	2 min.
Filling with water	Nil	10 "	5 "
Washing	1 hr.	1 hr.	1 hr.
Discharging	10 min.	10 min.	10 min.
Transferring (filters)	10 " (pulp)	10 "	2 "
Total	2 hr. 30 min.	2 hr. 40 min.	2 hr. 19 min.

Without knowing the conditions as they exist at the Liberty Bell that would influence the cost of a filter installation, such as present arrangement of vats and tanks, power required by the Moore filter, ground contours, etc., I am unable to carry this comparison to its logical conclusion, wherefore it is incomplete.

A statement from Mr. Nutter as to why it would not be better to install a properly designed filter-box; why a gravity plant could not be placed; and why one 9-in. pump would not be sufficient, would seem to be in order.

MARK R. LAMB.

Mexico City, December 22.

The Copper of Shasta County, California.---II.

Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

The history of the active development of the copper resources of Shasta county dates back to 1896, when a strong English corporation entered the field and disclosed the great mass of ore at Iron Mountain. Prior to this, Shasta county had been the scene of some placer and pocket mining, while the outcrops of the copper deposits had yielded large returns in silver and gold, before the fact was realized that the most profitable and permanent industry was to be found in the mining of base metals. As early as the sixties, however, small shipments of oxidized copper ore were made from the Bully Hill district, and taken round the Horn to the Swansea smelters. The development of the Iron Mountain mine marked the birth of the present thriving copper industry. This mine was worked successfully as a silver and gold mine, the gossan being treated in a 10-stamp mill and the sulphides chlorinated. The chief product was silver, but the fall in price during 1893 and the presence of base ores brought the profit to zero. It was then that English capital took hold of this mine and started operations on a large scale.

This district may well be considered in detail, as it is typical of the western, or most important part of the belt, which includes also the Balaklala, Trinity, and Mammoth copper mines. In the eastern portion there are a number of mines of a different type, of which the Bully Hill and Afterthought may be taken for detailed consideration. In the former district the mines are entirely exploited by adits, while in the latter, the narrow and deep orebodies are mostly explored through shafts.

The Iron Mountain mine, the richest and most developed in the district, is connected with the smelter and Southern Pacific railroad by a narrow-gauge railroad 11 miles long and of 3.3% grade. This mountain road climbs about 2,000 ft. and is one of the most remarkable in the Western States. The numerous curves, only partially compensated, deep cuts, high trestles, and loop make it a road that would naturally be expensive to construct and maintain. The problem of railroading under these adverse conditions, hauling cordwood, flux, and supplies from the main line, switching roasted and sulphide ores in an awkwardly constructed yard, and above all, keeping up an adequate supply of ore from the mine with a small storage capacity at the smelter, has required great ingenuity and care.

Keswick, the pioneer smelter town of this important copper region, was once the scene of an activity that has never been repeated. Before pyrite smelting was introduced, the ore was mostly roasted in open piles or stalls, giving employment to hundreds of men, and great quantities of coke were required. Cord wood, partly cut from the adjacent hills and later floated down the Sacramento river, was used at the rate of 60,000 cords per year before the introduction of electric power. These operations resulted in a payroll of 1,200 men at the smelter alone. This is a great contrast to the present methods. The new smelter at Kennett is typical of a modern plant; but it is due to the development of ideas resulting from many costly experiments undertaken at Keswick. Almost every misfortune that could befall a mine and smelter had befallen this property, the list of troubles including mine fires, labor difficulties, and litigation. In spite of this, however, the problem of smelting the ores of Shasta county was worked out entirely at Keswick, the old method of roasting and smelting with coke being gradually improved and ultimately culminated in the adoption of pyrite smelting, with a remarkable run of 11 days without a pound of coke in 1905. The Keswick smeltermen have solved the local problem of ore reduction, and it is satisfactory to see such dogged industrial determination give good results, and to note that the men who directed the first smelter are now applying the methods that were developed by their skill.

The mining of the Iron Mountain orebody has presented several difficulties that are full of interest. For some years the mine has been on fire and the resulting gas and heat have made the underground conditions very bad.

Keswick Smelter.

Blast furnaces, roasters and converters, making blister copper.

That spontaneous combustion often accounts for outbreaks of fire is probable, because the fine pyrite dust, when in contact with decaying timber in a stagnant atmosphere will generate sufficient heat by decomposition to burn. The fire makes the temperature of the rock and working places high and fills the atmosphere of the mine with sulphurous acid gas, while the water is a strong solution of iron and copper sulphates with free sulphuric acid.

The conditions that seem to favor fire are rottiug timber covered with pyrite dust in a semi-permeable filling in which small pieces of ore occur. Rock temperatures of 600° F. may be observed in the immediate neighborhood of the fires and yet rock of this temperature has been mined—a fact creditable to the determination of the management. The system of miuing has been to extract the ore in horizontal slices, each 10 ft. thick. In addition to this, a sub-division is made on each horizontal slice so, that the two end stopes are separated by a centre pillar to prevent the spread of fire. A main adit is driveu through the country-rock and across the orebody to the farther side. From this, drifts divide the stope into a number of pillars about 50 ft. square. These are 'robbed' by slices one set in width and the whole stope is 'worked home,' the entire space being well packed with filling and the timber left in position. No opening of more than two sets in width is left unfilled. The system of working is shown in the accompanying diagram.

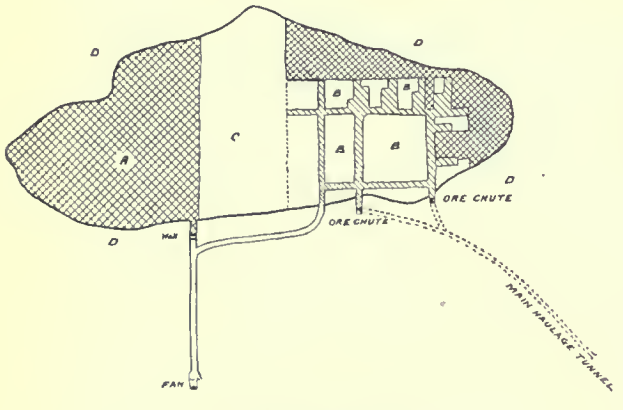


Fig. 1. Method of Working.

A, Filled ground. B, Undeveloped ore. C, Fire pillar. D, Country rock.

The rock breaks easily, being traversed by a number of fissures in certain well-defined directions; often blasting is unnecessary. In driving through old filling, serious runs of fine calcined dust have occurred without warning, which together with a sudden outburst of gas, prove dangerous. In working the hottest places where there is fire, a careful watch is kept on the rock temperature and a plentiful supply of water is piped to the face. Timbers are soaked and, after blasting, the rock is cooled with a spray. Ore may be worked at a temperature of over 800° F., but at this heat the fine ore will burn as it falls through the air, and in blasting the combustion of the fine dust makes so much gas that it is often difficult to get back directly afterward, which is necessary, as the timbers must be constantly wetted. With a rock temperature of this exceptional intensity, the air at six feet from the face can be maintained at 100° to 110° by the system of ventilation used. For blasting at this temperature, the holes are cooled by leaving a hose running in them for some time, wrapping the powder in asbestos or rags and lighting the fuse before putting the powder in the holes.

Stopes are sometimes temporarily lost through an outbreak of fire and in such cases it may be advisable to remove all machinery, cars, and rails, and shoot down timbers or build walls, so as to isolate the danger zone; but in some cases the fire may be fought and successfully subdued. If a mass of ore is known to be very hot and surrounded by smouldering filling, it is better to approach it from above and always with a low drift. If the fire is above, or the drift is broken high, the fire will fall on the lagging above the caps, where it cannot be fought as well as on the floor.

The conditions are not good for efficiency among miners, but the Italians, who alone will work under such trying circumstances, work fairly well. The gas, acid water, and great heat make extraction difficult, for, although the temperature, usually about 90° and in some cases as high as 110° F., is not so intense, it must be remembered that a dry heat is very much better than this steam-laden, gaseous atmosphere with strongly acid and coppery water dripping in many places. The cost of driving adits in the country rock—a silicified and sheared rhyolite—is shown in a table below, while the cost of extracting ore is about $1.50 per ton. The mine has several natural advantages, which help materially in keeping down the costs of extraction. The ore is easy to break and blasting is often unnecessary. Furthermore, there is no hoisting or pumping, as the mine is entirely above the level of the gulch in which the camp is situated.

COST* OF DRIVING IN SILICIFIED RHYOLITE.

Tunnel 8 ft. 6 in. by 9 ft. 6 in. Length 494 ft.

		Supplies.							
	Wages.	Explosives	Illuminants	Timber	Total	Tool-sharpening	Track-laying	Superintendence	Total
	$	$	$	$	$	$	$	$	$
Drilling, per foot.	1.570	.....	0.043	.....	0.043	0.126	.....	.....	1.739
Blasting " "	0.504	1.047	0.0 4	.....	1.061	.....	.....	.....	1.565
Mucking " "	2.360	.....	0.057	.....	0.057	.....	.....	.....	2.417
Outside tramming, per foot..	0.900	.....	.....	.....	.....	.....	.....	.....	0.900
General " "	.....	.....	.....	.....	.....	.....	0.3 9	0.334	0.683
Timbering "	0.810	.....	.....	0. 76	0.6 6	.....	.....	.....	1.516
Total	6.174	1.047	0.114	0.6 6	1.837	0.126	0.349	0.331	8.810

Powder used per foot of tunnel ..... 7.88 lb.
Drill-holes, cost per foot $0.107
per drill sharpened ..... 3 5 ft.
per foot of tunnel $14.75
Average time of drilling round ..... 15.3 hr.
" " loading, blasting, and setting up ..... 5.44 hr.
N. B.—The tunnel was only partially timbered. 171 ft. being supported by round timbers.
Wages: Machine men and timbermen, $3 per day; muckers. $2.50.
*Exclusive of power and depreciation of machinery.

The system of ventilation is especially interesting. Several Sturtevant fans, 5 ft. diam., are used to blow air into the workings. These are carefully regulated so as to maintain an equilibrium at the end of the workings and hold back the gas in the filling, thus placing the combustible material in a neutral atmosphere. If a proper statical pressure is maintained, air will not penetrate the filling so as to fan the smoldering timbers to a blaze, and the back pressure cannot force the gas into the workings. The system, though it is simplicity itself, has solved what might have seemed an insurmountable difficulty.

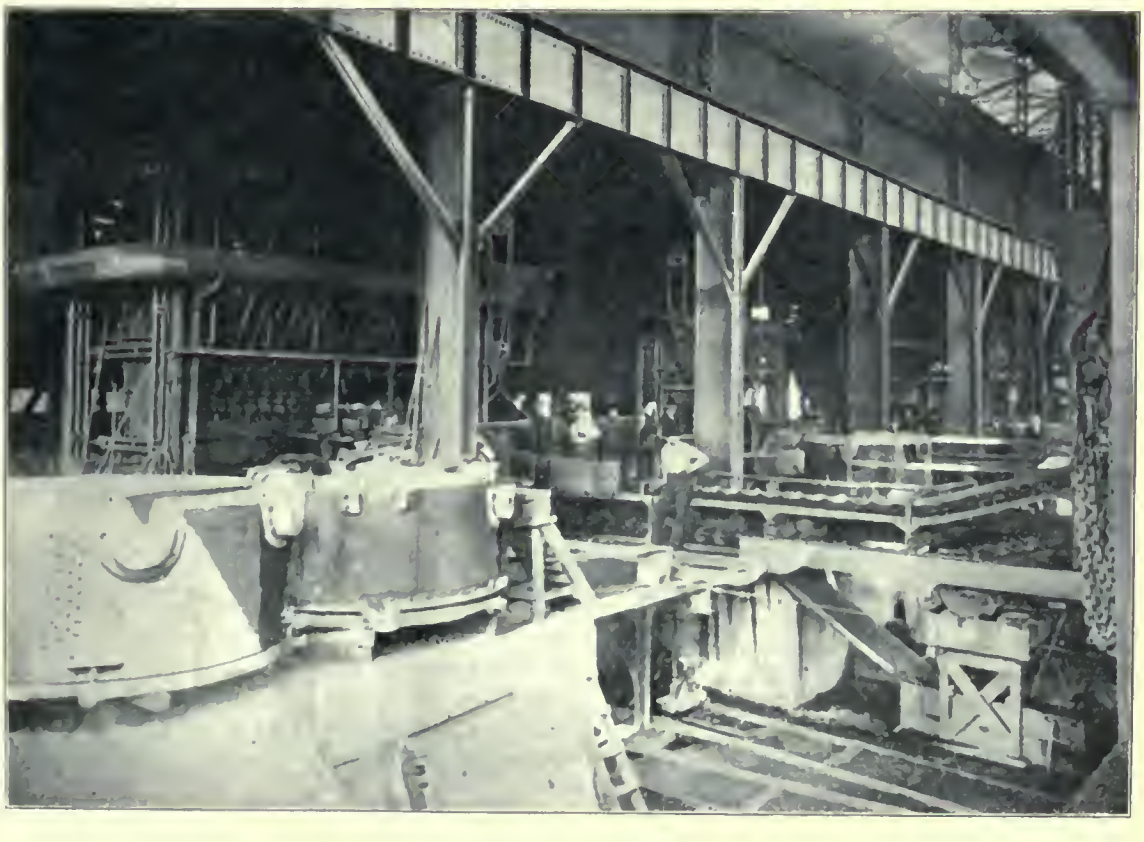
Filling for the mine is partly obtained by driving for development in country rock and partly by quarrying on the surface. The ore is loaded directly into trolley cars underground and taken to bins above the railroad terminal. Here it passes through a coarse crusher and after screening, the various sizes are passed down a gravity incline to separate railroad bunkers, where it is shot into the railroad cars and taken to the lower railroad termi-

nal, to be put on the storage piles or transferred to broad-gauge cars, accordiug as assays or circumstances require. Generally three sizes are separated: Coarse or 'run of mine' ore; 'nuts,' screened from 2 to 4 in.; and 'fines.' Special sizes are made according to order for some sul-

Kennett Smelter.

Simple arrangement for single concentration to low-grade matte.

phur burners, etc. The cost of transferring ore from narrow-gauge cars to stock piles, and then to crushing and sizing plant and loading on broad-gauge cars is economically carried out. The different grades of ore, in separate piles, are loaded with a steam-shovel and may



United States Smelter.

Showing furnaces, settlers, and slag disposal.

be mixed to get any desired grade. The cars are then switched and dumped into bunkers over the crusher and trommels from which the ore passes on to a picking belt and thence into broad-gauge cars. By this means the ore can be transferred, crushed, sized, and picked clean

transferring used to be often trebled. A hydraulic cylinder was put in the bottom of the bin, fitted by a steel plough 2 by 4 in. by 6 ft., which was fixed transversely across the end of the piston. By working this slowly to and fro, to make an undercut, the packing of the ore was entirely prevented, and a steady stream of fine ran down the chute, effecting a great saving in cost.

An important asset is the mine-water, and one which is highly profitable. The water contains free sulphuric acid, copper and ferrous sulphates, the latter being soon

of waste and zinky stuff, and loaded, all at a cost of about six cents per ton, which includes labor and supplies.

An ingenious device has been employed to overcome the difficulty of packing the fine ore in the bunkers. The ore cakes hard and forms an arch, so that the cost of

oxidized to ferric sulphate on exposure to air. This water, coming from the mines at a temperature varying from 80 to 130° F., is led through a series of three precipitation vats. Each vat has three compartments in parallel so that one is usually being emptied and two are in use. Their length is 200 ft. each, with an inclination of about one-half per cent. In each vat or box there are two or three riffles, but these are often dispensed with, if the water is plentiful. Scrap tin-plate is used for precipitation, and is more economical than scrap-iron, because the action is more rapid and less handling is necessary. The excess of free acid in the water liberates great quantities of hydrogen. Attempts to neutralize this acid have not proved successful, and it increases the consumption of iron to such an extent that the economic limit of copper extraction is attained when the cost of iron dissolved is equal to the value of copper obtained. This economic limit is reached when the water escapes with about ten parts per million of metallic copper.

The selection of scrap tin-plate is a matter of some importance. Fruit and fish canneries, coal-oil dealers, and the like, have splendid material, but the supply is somewhat limited and must be bought at seasonable opportunities. Lacquered tin must be avoided, as it is most persistent in resisting solution, and will often take weeks to dissolve, whereas with bright tin, the bundles are often dissolved as quickly as two men can feed them into the first vat. A good supply of water under high pressure is laid on, so that the tin can be well scoured if it becomes coated or dull. Almost the whole of the copper is deposited in the first box, but assays are regularly made to determine the losses, the outlet, and the extraction in each box. The mine-water will usually carry from 1,000 to 3,000 parts per 1,000,000 of metallic copper, but the first box will reduce this to 15 or 20 parts, and the outlet should not exceed 8 to 10 parts. With this extraction the economic limit is reached, the consumption of iron by the free acid being too high to justify the extraction of the remaining copper. When sufficient copper is precipitated, the water is sluiced off from a box, the tin raked out, and water syphoned to the next vat, and the copper cement taken to the drying furnace. This assays about 83% copper and contains some sulphuric acid. If left in a damp state in the open air, it will sometimes get red hot and form a fused mass. It is largely used for painting the bottoms of ships to prevent the growth of barnacles, owing to its poisonous character.

At the Mammoth mine the lode is extracted in slices and timbering is put in. The ore is entirely removed and the roof allowed to come down. From the mine, the ore is transported to the smelter, a distance of about three miles, by an aerial ropeway which has not proved altogether satisfactory. The Bully Hill mine differs in many respects from those on the western portion of the belt. It was opened as a gold mine, and the gossan was worked with indifferent results, until copper ore was developed at depth. Bully Hill is composed of basic and acidic eruptives, principally rhyolites and basalts, with a series of mineralized shear-zones in which lenses of ore and pyritic impregnations occur. The mine is developed on the upper levels by a number of adits, and in depth by a shaft 600 ft. deep, equipped with an electric hoist. The irregularity of the ore deposits and ill-defined zones of mineralization, make the development of this mine a matter of difficulty. Drifts are generally driven about 20 ft. in the foot-wall, cross-cuts to the vein being made at regular intervals. In this way a number of valuable deposits have been discovered, in some cases chalcopyrite, several feet in thickness, being found. In the upper workings a gouge occurs in the shear-zone that is rich in oxidized copper ore. The cost of extraction is not easily determined, as a large amount of the rock extracted is used for filling, and data as to costs are not available.

The same company is actively developing mines at Winthrop and in the adjoining Copper City district, and with the completion of a railroad up the Pitt river, the prospects of a considerable output of copper and precious metals are excellent. This ore is more silicious and nearly self-fluxing, although small quantities of iron ore and limestone are used to flux those containing an excess of silica. Barite is a marked constituent of this and the Afterthought ore, while zinc-blende is also found in large quantity. In the past, the cost of freight has killed the profitable extraction of copper, as the hauling of coke cost $8 per ton, in addition to the exorbitant rates on the Southern Pacific and Bellavista railroads. The Afterthought mine resembles the Bully Hill in many respects, but the quantity of ore is less, and the associated minerals are very troublesome. Large quantities of zinc-blende and barite occur in this district, and these minerals have caused incessant trouble to the smeltermen.

The larger and more important mines are those that occur in the western part of the belt, but in the Bully Hill district the ores are often of much higher grade, both in copper and precious metals. Shasta county will undoubtedly make its mark on copper statistics in the next few years, and while the development of large ore-bodies is more than probable, the present smelters under construction will be smelting 3,000 or 4,000 tons of ore per day in the near future.

An Interesting Letter.

The following communication was received by two mining engineers who were in Nevada recently:

GoldField Hotel, GoldField.

Messrs. Smith & Jones

Dear Sirs I see by Our Daly that You are hear looking for some Good Properties and we have Many of them from one thousand to Five Thousand to Ten Thousand up to One Hundred and tweutyfive Thousand per Groupe of Claimes and in Nos fromthree to Eight in a Groupe all have well Defined Ledges that assay from threeto Twenty three Dollars per Tone and some PanFree Gold to the Valuation of twenty to thirty dols and we Have 4 Groups in the Heart of the GoldField District surounded by Properties that Money can not By such as the WhiteRock Ajoiniug the January Mines and Surounded by such Notied Mining Propertiesas the Florance. the Combination. the Jumbo. the Mowhawk. and the Redtop. all Heavy Shipers with great Recards. as Heavy Producers for thire age.

Terms and Prices on the White Rock Groupe of Eight Claims

One Hundred Thousand Dollars of Payments of Twelve Months From date OF Bond. and Lease. with 15 per Cent Royalties on the out Put of the Ground during the Life of the Lease first Payment Tweuty thousand Dolars Cash on Making the Bond or as a bove One Hundred Thousand. and Twenty Five Thousand Dollarsin Stocks of the same.

or Eighty Thousand Dollars in Cash will bye this Property Out Right

MRS. A. B. TOMPKINS

if You wish to see Me. in regard to any of those Propites i will Be at My Home in the Tompkins Addition to Morow the25th

REGULAR stage service, twice a week, will be maintained this winter between Valdez and Fairbanks. The new winter trail saves fifty miles over the old one.

Car Shortage in the Middle West.

Written for the MINING AND SCIENTIFIC PRESS
By an Occasional Contributor.

Car shortage is a perennial trouble in the coal business. This year it has been unusually severe and protests have been heard on all sides. After a long and disastrous strike, a dull summer, and a lagging autumn, winter sets in, and the demand for coal is accentuated just at the moment when the rivers threaten to freeze and railway transportation breaks down. It is no wonder that the coal operator feels sore. Car shortage at this time of the year is expected, and a normal car shortage is accepted as one of the ills incident to business, but this year it is no exaggeration to say that in many quarters coal transportation is simply demoralized. This works peculiar hardship on the coal operator for a variety of reasons.

In normal times the producing capacity of the coal mines of the Middle West is 30 to 40% above the annual demand. The coal of these fields will not stand storage and must always be mined as used. The largest single market is afforded by the railways, and in this territory the railways are busiest in the fall and winter. It is then that the crops are moved and that Christmas and other goods are shipped into the rural districts to remove the surplus wealth accumulated by the farmer. It is then that coal itself must be moved to heat and light the towns, homes, and factories of the great Northwest. Coal itself is the largest single item of traffic on most of the roads of the region. It affords from 25% of the traffic of the granger lines to 60% of that of certain coal roads. In the case of an average road such as the Illinois Central, 34% of the traffic is coal, and its movement is largely concentrated in the winter months.

In order to meet the demand of the winter, the collieries must be built for a large annual capacity. The result is that they are run at a loss during the summer, being operated only enough days per week to hold the men, and then mainly on company work—driving of entries and turning of rooms in preparation for the next winter. The average colliery of the region works 200 to 225 days in the year only, so that the "loss to the miners due to loss of time," usually figured after a strike, is largely a myth. In most cases the miner may cheerfully strike a hundred days in the year without loss to himself if he but bunch his strikes in the summer season.

In an effort to spread the work around, the miners have adopted various restrictive measures, some openly and some not so openly, which have had the general effect of increasing the number and size of the collieries, because, owing to the fundamental fact that the coal can not be economically stored, the mining must be concentrated in the winter months.

At the time of the anthracite strike prices of bituminous coal became abnormal. A large amount of new capital was attracted to the business. In the main this went into the purchase of nearly worked out or badly situated collieries, which their more experienced owners were glad to exchange for the cash with which to open new mines. As at that time any mine not contracted ahead could make a profit, every one was temporarily happy. The legacy, however, has been a load on the coal industry ever since, and these sudden spurts, attracting new capital and bringing in as they do a large number of inexperienced miners and operators, prove a heavy burden in the following years. As a result, during the recent years of prosperity the coal business has been in a bad way, as any business will be when supply exceeds demand.

In the meantime the great Northwest, which absorbs the surplus coal of the central and middle western States, has been growing—growing at an unsuspected rate. For the first time since the anthracite strike there seems now to be a real demand for all the bituminous coal that can be produced. The demand is probably slightly fictitious since last year, owing to the open winter, coal sold in December lower than in August, and retailers who stocked up in the fall lost money. Retail stocks last fall were certainly short. At the same time shipments into and through Chicago and St. Louis in the first ten months of 1906 were 25 to 30% higher than for the corresponding months of 1905, and this includes the period of the strike and the normally dull months. The coal mines, by a purely accidental chain of circumstances, are prepared to meet this gratifying and unusual demand, but the railways are failing them.

At the beginning of the strike one large railway system on which coal furnishes about one-third the traffic, had 40,000 coal cars in service. Foreseeing the difficulty, the general freight agent issued instructions for his subordinates to make particular efforts to secure shipments of lumber and other goods that might go in the coal cars. The result was that the company had no idle cars except such as it wished to use for storing coal. Practically one-third of its rolling stock was promptly absorbed by the demand designed to be met by the other two-thirds. Again; this fall a granger line depending on a coal road for its fuel-supply found its coal pile getting low. Upon demanding coal, it was told there were no cars. These being furnished, it was said there were no locomotives. These in turn being furnished, it required strenuous effort and vigorous pleas to recover them. It is foolish to say that cars and engines are not needed; that tracks and terminals are equally out of date is perfectly well known to every shipper except possibly a favored few. Deeper than all this is the fact that the railways are not up-to-date in their management of freight. Anyone who has tried in the last few months to recover freight lost in transit, knows that methods are defective when such things as steam boilers, so large that they require special cars for their transportation, disappear absolutely without leaving a trace on the company records and require the services of a private detective employed by the shipper to find them! Either the railway business has grown too vast for its managers, or they have been putting in more time watching the ticker than studying their own organization. The facts now being made public regarding the slow rate of travel for freight have long been known to shippers. They merely emphasize the statement that despite the almost total lack of organization of the business, the river steamboat today actually delivers freight more rapidly than the railway.

ORE STEALING.—That a form of 'high-grading' flourishes in Western Australia has been proved by inquiries instituted by police detectives in Victoria, resulting in a full confirmation of the suspicion that considerable quantities of Western Australian gold had been disposed of to Bendigo buyers, the number of whom is said to be out of all proportion to the requirements of legitimate business. It is now believed that the value of the gold annually stolen from the Western Australian mines is fully as large as estimated at the commencement of the investigations by the Royal Commission. It has also been ascertained that gold stealing is largely practised in Victoria, and the State Minister for Mines is to be asked not only to cancel all existing gold buyers' licenses, but also to declare all sales to be illegal unless effected through the Melbourne Mint.

MORE than 11,000,000 pieces of mail went astray in the United States last year because they were not even directed well enough for the experts to decipher the names and addresses.

Standardization of Screens.

The committee on standardization of screens, appointed by the council of the Institution of Mining and Metallurgy, London, has reported by its chairman, Mr. Walter McDermott, that it recommends the adoption of the following standard laboratory screens:

Mesh.	Diameter of wire.	Size of aperture.	Screening area.
	Inch.	Inch.	%
5	0.1	0.1	25.00
8	0.063	0.062	24.60
10	0.05	0.05	25.00
12	0.0417	0.0416	24.92
16	0.0313	0.0312	24.92
20	0.025	0.025	25.00
25	0.02	0.02	25.00
30	0.0167	0.0166	24.80
35	0.0143	0.0142	24.70
40	0.0125	0.0125	25.00
50	0.01	0.01	25.00
60	0.0083	0.0083	24.80
70	0.0071	0.0071	24.70
80	0.0063	0.0062	24.60
100	0.005	0.005	25.00
150	0.0033	0.0033	24.50
200	0.0025	0.0025	25.00

Owing to difficulties in wire-drawing and in the weaving of wire-cloth, absolute accuracy to the fourth place of decimals of an inch is unattainable with uniformity of 25% of screening area; but the above table is so near to theoretical perfection, and the unavoidable irregularities of screening tests themselves are so wide that any inaccuracies in the table would be absolutely immaterial in practice. It is not possible to weave the 200-mesh screen except in what is known as 'twilled' or double wire, and it is questionable whether the table should not stop at 150 mesh as being fine enough for all practical sizing tests by screen.

The advantages of the series are:

1. That a definite ratio between aperture and mesh is secured.

2. That by adopting a screening area of 25%, the wires are absolutely 'locked' in position, thereby preventing shifting and consequent irregularity in the size of aperture.

3. That the ratio between wire and aperture in all meshes being constant, the 'cup' factor is also constant.

4. That as the table is based on the curve of seriation, any other sizes of mesh can be readily determined.

The Committee appends a memorandum explaining in some detail the grounds and arguments upon which their recommendations are based, and they desire to add that these recommendations are the result of the most careful consideration of the suggestions of users of screens in all parts of the world, and of the views of British and American manufacturers.

In an appendix the Committee states that, assuming the adoption of a standard series of screens, which makers of wire-cloth could supply, there was practical unanimity as to the advantages of retaining the description of the various sizes by "mesh per linear inch," for the following reasons:

Those who objected to the use of the term 'mesh' based their objections on the fact that in the past it had not denoted the size of aperture; but as the whole object of establishing a laboratory standard would be to fix definitely a certain aperture for a certain mesh, it would be simply a matter of convenience of terms as to whether a screen were described as a certain 'mesh,' or with apertures expressed in decimals. There could be little doubt that in practice engineers would continue to use the term 'mesh' by choice, because it is shorter, really descriptive, easily remembered, and precisely as accurate as, because interchangeable with, a certain size of aperture. An agreed standard table giving the size of aperture in decimals of an inch, for each standard mesh, would obviate any confusion. The suggestion of one or two engineers that in future aperture should always be specified alone would be unworkable in many cases, and would not necessarily ensure accuracy or uniformity. Micrometer measurements of fine wires when once woven and crimped are not always to be relied on, and uneven weaving would in practice vitiate conclusions as to size of aperture much more than in the case of the use of standard screens specially prepared for laboratory use. The dependence on every individual who reports screening tests to verify the measurement of such screens as he happens to have by means of a micrometer, even if advisable or practicable, would produce results of grading that could not easily be made comparable with results obtained elsewhere. The attempt to use a standard of apertures in arithmetical ratio, accurate to two or three places of decimals, is pronounced impracticable by wire-cloth makers; and in any case would only prove to be the introduction of a new arbitrary scale of grading, differing greatly from past practice, and offering no advantage over an agreed standard set of screens such as are now advocated.

The report of the Standardization Committee of the Transvaal Chamber of Mines covers a larger field than the Mesh Committee of the Institution has at present in view, and enters on the question of large-scale manufacture of wire-cloth and screens and their use in actual crushing operations. As regards the description of screens in mills, the Mesh Committee does not propose for the moment to put forward any suggestions. There are difficulties to be considered from the fact that managers of mines are likely to be guided by personal opinions of expediency in connection with the kind of ore, type of crusher, cost of material, and subsequent processes of treatment. It is well known that different ores, different quantities of water, wet or dry crushing, and different crushers, all give varying characters of discharge through exactly the same screen. The Committee, therefore, recommends in the first instance, the establishment of one uniform standard method of expressing grading analyses of all mill products, in the laboratory, which would enable accurate comparisons to be made.

Only comparative accuracy can be attained in the description of mill-screens made in commercial quantities, owing to the fact that, both in the drawing of the wire and in the weaving, considerable irregularity always occurs.

There is practical unanimity in approving the adoption of a standard table which, while not departing much in the size of aperture from what is already associated with certain commonly used meshes, would secure a regular arithmetical ratio between mesh and aperture. In considering the table embodied in the Committee's report the following points should be kept in view:

There must be limits both at the coarse and fine ends of the table, to be determined by consideration of utility, common practice, and the requirements of manufacture. The number of sizes between these limits should be reasonable, for it is not desirable to introduce excessive refinements and a large number of screens in the laboratory; and it is not necessary to ask makers to manufacture in small quantities with accuracy, and keep in stock a number of standards which the great majority of engineers will never use in practice. The engineer who requires special refinements in a particular case can use any kind of screen and, by giving its aperture, enable comparison to be made with the nearest standard mesh. Grading by screens can never be exactly scientific as a measure of the size of particles, and therefore it is useless to pretend to unnecessary refinements; and the usual practical requirements in ore treatment may be perfectly well secured in the classification of particles by a comparatively few screen-sizes, as hitherto. As an illus-

tration of the futility of taking screen grading as an exact scientific measurement of particles, it is only necessary to point out that the actual size of the maximum particles passing through any given screen varies with different ores, different methods of grinding, and different methods of using the screens.

After consultation with manufacturers of wire-cloth, it appears that there should be no difficulty in getting makers to weave accurately the small quantities of the standard screening recommended by the Committee to supply the demands of all engineers for laboratory purposes.

There seems to be a general opinion that material passing the finest screen of any standard series should be divided into two classes, and not be described under the one heading of 'slimes.' Various suggestions have been made as to the method of division and as to the terms to used for describing the three degrees of fineness of particles. The general opinion seems to be that all material coarser than 150 mesh should be described as 'sand'—coarse or fine, if preferred; that the portion passing 150 mesh, but readily settling in water, should be described by some such term as 'meal;' and that the term 'slimes' should be limited to particles which settle slowly in water. It may be difficult to get any general agreement as to the division between 'meal' and 'slimes;' and even if this be made arbitrarily, it will remain a fact that two materials having the same settling speeds may not be of the same size of particles, character, or permeability. Some such rough division of the two classes would, however, tend to greater accuracy and uniformity of description than is usual at present, and it is suggested by the Mesh Committee that particles passing 150 mesh, but settling in — minutes in a — inch column of water be described as 'meal.' The limiting factors in this definition are to be determined by subsequent discussion among metallurgical engineers.

THROUGHOUT three centuries the philosophical faculty was predominant in its position and influence in the university. It had come to represent a body of more or less abstract instruction covering by far the greater part of the existing field of human knowledge, and, it must be said, divorced largely from the real things to which it properly belonged. In the early history of universities it constituted a sort of purveyor of privileged or aristocratic learning ostensibly of better birth than the professional faculties of law and medicine, which had the misfortune to deal with the actualities of life on which the welfare and safety of communities no less than the rights and duties of individuals are fundamentally based. This conventional class distinction constituting a kind of snobbery of learning was the real influence or force so completely overcome by the movements of humanism and the reformation, and it has bequeathed to us the useless and senseless term 'pure' science as opposed to applied science; as if there could be in some way a science politely distilled as an essence of learning separated from the realities with which absolutely all science whatever has to deal and without which no science whatever can exist.—*William H. Burr.*

THE vagaries of unfair freight rates are exemplified in a striking way by the fact that a consignment of machinery sent from San Francisco to a mine in Rhodesia, in south-central Africa, was transported cheaper than the same material could be sent to Goldfield, Nevada. In the one case it had to cross the American continent, traverse the Atlantic to England, thence to Beira on the east coast of Africa, and then by train to the interior—a total distance of over 15,000 miles, as against 800 miles to the mining town in Nevada. Comment is superfluous.

Weight of Charge as Affecting Reduction in Silver-Lead Smelting.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

In 1896, George B. Lee, at that time superintendent at the Union Smelting Works, Leadville, Colo., was much worried by blast-furnace lead losses amounting to upward of 25% of the total lead charged. The slag was clean, the matte low, the furnaces fair on top, but still this loss occurred shift after shift. Sometimes not a single bar of base-bullion was dipped on some furnaces for two shifts. Several metallurgists were consulted, but, after trying their suggestions, the same thing continued. The amount of matte produced was smaller than it should be; and the furnaces began to blow and to settle badly. One after another of the furnaces was run down and the lead appeared to have gone into the wall accretions. One furnace after ten days' running had the accretions due ordinarily to two or three months. The heat was evidently too high up, and the lowest permissible limit of fuel had been reached (14.5 to 15% of Starkville coke with 20% of ash—but no charcoal). The furnaces were low and the ores included much very fine roasted sulphides containing 10% zinc.

Robert D. Rhodes came from the Arkansas Valley works near-by, and puzzled over it, and suggested thicker layers in heavier charges. Mr. Lee essayed this by feeding two fuel charges, then two ore charges. Somehow the night feeder got mixed about it, and started to feed four fuel, then four ore charges. This made a layer of coke of 600 lb., a layer of charge of 4,000 lb., and a layer of slag of 1,500 lb., so that the coke layers were separated by 5,500 lb. of cold material to be smelted. This seemed excessive for a furnace 13 by 130 in. at the charge-floor, but the queer thing was that all trouble ceased. The furnaces reduced well, ran very fast, and kept in splendid condition. Mr. Lee's idea was that with the thinner layers the fuel was almost continuous, while in the new way there was a serious of breaks, making it harder for the fire to climb up, and besides the more fusible slag was farther away and therefore less liable to be melted by the coke below it.

Both A. S. Dwight and Anton Eilers suggested that the ore was too coarse, and would reduce better if made finer, so as to retard and come more intimately in contact with the reducing gases. It was found that this helped also.

ONE hundred years ago, according to *The Copper Handbook*, the mines of the globe produced an average of about ten thousand tons of long copper yearly—less than the present yearly output of either nickel or aluminum—while in 1906 production was at the rate of 15,000 long tons per week, and there is much talk of a copper famine—to which color is given by the present price of the metal, which is higher than for 25 years past. In 1905 there were fifteen individual companies each of which produced more copper than all the mines of the globe combined produced in 1805, and two mines, each of which made as much of the metal last year as all of the mines of the world made during the first five years of the nineteenth century, the two mines in question being the Calumet & Hecla of Michigan, and the Anaconda of Montana.

Of the fifteen mines of the globe that made 25,000,000 lb. or more each of refined copper in 1905, ten are in the United States, while there is one in Mexico, in Spain, in Germany, and in Japan.

AS CAPITAL becomes abundant the interest or profit which it can obtain becomes lower, on account of competition among the capitalists themselves.

Cyanide Clean-up.

By James E. Thomas.

*In designing a milling plant it has always been the practice to erect a separate room for cleaning and pressing amalgam, and for treating any rich product, such as die sand, etc., and I think it is still more important that a separate room or floor should be set aside for the corresponding operations in a cyanide plant, as the liability of losses occurring in handling gold slime is much greater than in handling amalgam.

I therefore propose bringing forward a few suggestions with the view of evoking discussion on the subject—too long neglected—so that the engineers who design these plants may have a fairly definite idea of what is really required.

The clean-up floor should have a drainage separate from the rest of the extractor-house floor, so that any washings shall not be contaminated with oil and grease from the pumps, etc., and may be run into a sump from which the residue, after settlement, may be easily collected and included in the next clean-up. Means of transport of the gold-bearing zinc, etc., from the extractor-boxes to the acid-tubs should be somewhat better than those afforded by the proverbial Kaffir and a bath or bucket. Much time and also labor is wasted by that method. An overhead crawl with tipping buckets could, I imagine, be easily installed in most plants and would soon pay for itself by the saving of time and labor, not to mention the decrease in liability of having gold slime accidentally split on the extractor-house floor, whence it is apt to be carried by the traffic to the outside of the building and lost.

The acid-treatment plant is often totally inadequate for the proper dissolving of the zinc and insufficient allowance made for the washing of the gold slime before filter pressing. I find it better to have two acid-treatment tubs of a certain capacity than to have only one of the same total capacity, as, when two are in use, one may be fed while the other is suffering from a threatened attack of 'boiling over,' while, when only one is installed, nothing can be done until the attack has succumbed to the 'cold water cure.' A stoppage at the acid-tubs throws back the whole clean-up, and the time thus lost cannot be made up.

When filter-pressing is begun I have always found that it may be much more quickly accomplished when the gold slime is drawn from the bottom of the washing vat than when the suction from the filter-press pump is slung over the side of the vat. As the gold slime is very heavy, it is advisable to use a specially short length of hose for the filter-press pump suction. If, when running down the charges from the acid-treatment tubs, everything is put through a 64-mesh screen and the contents of the washing vat kept in agitation while the press is being filled, there is no danger of the rose over the suction drain-pipe becoming choked.

The use of filter papers over the cloths of the press is also to be recommended, as filling is thereby facilitated and the life of the cloths is prolonged, as no scrubbing is required to clean them.

The filter-presses supplied have invariably, in my experience, the openings to the hollow frames left rough cored and with a quantity of fused moulding sand blocking the passages. By having these openings filed out so that the combined area, in a full press, is equal to or greater than that of the filling channel and with a slight increase of area toward the inside of the frames, there will be less liability of their choking, and the press may be filled in about 30% less time than when they are left rough.

For washing the cakes while in the press it is advisable to use hot water, not only for its better washing effect, but also because the cakes can be got out dry, even if there is only a layer of gold slime on the papers or cloths. A 400-gal. tank placed over the flue of the calcining furnace, if the latter is fairly close at hand, so as to utilize the heat from the escaping gases, will generally be found capable of giving enough hot water.

It is essential that a vat large enough to take all the washes from the washing vat and the filter-press be installed, so that the washes may receive further treatment before being run to waste.

Gold has been found to be present in solution in the acid washes. This is apparently due to the presence of hydrocyanic acid. The more completely the acid treatment is carried out, that is, when no zinc is left undissolved, the more danger there is of gold being redissolved. It is therefore advisable to have the washings slightly acid and then sprinkle zinc fume over the surface, meanwhile keeping the solution agitated. This should be done each time a charge from the acid-tubs is transferred for washing. After the clean-up is over it is advisable to have the contents of the large vat for the washings assayed, after good settlement, and, if necessary, more zinc fume can be added before the solution is run to waste. By this means the gold in acid washes run to waste may be reduced to 0.07 dwt. per ton, whereas the ordinary acid washes will probably carry 1.5 dwt., or more per ton. Copper sulphate, finely divided iron, and charcoal were also used for this purpose in the laboratory experiments, but, as zinc fume gave the most satisfactory results, it was tried on a working scale with such success that it has been used on all the mines of the Consolidated Gold Fields group ever since a supply could be procured. It is prepared by the distillation of zinc *in vacuo* and should be packed in air-tight cases, as it oxidizes readily on exposure to the atmosphere and is afterwards, of course, useless for this purpose. From five to seven pounds are sufficient to treat washes amounting to about 100 tons.

For taking off the acid washes from the washing vat it is advisable to use a decanter. If the arm of the decanter be painted white, the operator can see at a glance whether the solution is clear enough to draw off or not. The paint will last through a clean-up and can be easily renewed. The washing-vat may have a false bottom of cement sloping toward the outlet to enable it to be more easily cleaned out. The cement should be painted over with P. & B. acid-proof paint after each clean-up. If this is done it will show no signs of wear. When the paint is being applied it is as well to keep an eye on the person doing the job, as I have had a Kaffir overcome with the fumes from the paint when at work on the bottom of a vat 10 ft. deep. He quickly recovered on being taken to the fresh air.

Stirring gear for the acid-dissolving tubs should be installed, but the motion should be reversible, as it is often found expedient to reverse the direction of stirring in order to help the dissolving of the zinc and to free any which may have collected round the upright carrying the paddles.

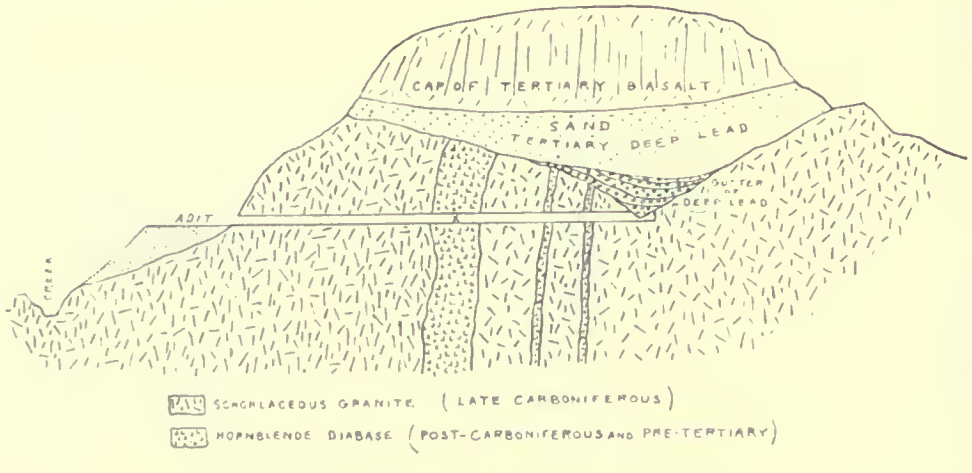
*Abstracted from *The Journal* of the Chemical, Metallurgical & Mining Society of South Africa, October, 1906.

In the miners' changing rooms at one of the German collieries (Shamrock-Westphalia) each man is allotted a place and is provided with a hook and pulley near the roof, and a rope by which he can pull the hook up or let it down. On arrival he lets down the hook with his mining clothes, changes, and hoists up his home clothes to the roof, then padlocks the end of his rope so that no one can disturb them.

The Occurrence of Diamonds in Matrix at Oakey Creek, Near Inverell, New South Wales.

Written for the MINING AND SCIENTIFIC PRESS
By T. W. EDGEWORTH DAVID.

Recently four diamonds have been found in the original rock matrix in which they grew or crystallized at the above locality. The discovery is interesting from a scientific point of view, and may yet prove of economic importance. Hitherto diamonds have been found in their original rock only in two parts of the world, namely, South Africa and Brazil. In South Africa the diamonds occur in great numbers in a matrix of a basic volcanic breccia in numerous volcanic necks or pipes. In Brazil a single specimen of gneissic rock was found some years ago containing a diamond in matrix, but unfortunately the specimen has now been lost, and no similar ones have been subsequently found. Now for the third time diamonds have been found in rock matrix, in this case in the State of New South Wales, Australia. The discovery was made by two miners, Messrs. Pike and O'Donnell, at Oakey Creek, about 20 miles from the town of Inverell. At the time they were engaged in driving a tunnel through the hillside in order to penetrate the rim rock of granite, which formed one of the boundaries of a deep lead (capped by basalt) of stream tin and alluvial diamonds. In driving the tunnel three dikes of hornblende-diabase were intersected in the granite. These are all nearly vertical and are strongly intrusive into the granite. The dike-rock is dull greenish black in color and, at first sight, resembles serpentine. The first dike struck was 26 ft. thick, while the other two were much thinner. In the very centre of the first dike a diamond about half a carat in weight was found to be imbedded in the solid eruptive rock. The scene of the discovery was at once visited by E. F. Pittman, the Government Geologist of New South Wales, who, as the result of a searching investigation, was quite convinced as to the genuineness of the discovery. Three more small diamonds were subsequently picked out of the more decomposed portion of the diabase dike, after it had been exposed for some time to the action of the weather. One of these is specially interesting, as it exhibits on its surface comparatively deep corrosion hollows filled in part with portions of the matrix of hornblende-diabase.



Daimantiferous Pipes Near Inverell, New South Wales.

This specimen, together with that of the diamond still *in situ* in the matrix, was exhibited by me to the Geological Section of the British Association for the Advancement of Science, at their recent meeting at York, England, last August. All unanimously agreed as to the absolute genuineness of the discovery. Sir William Crookes, Professors Bonney, Miers, Boys, Grenville Cole, Doctors T. H. Holland, and J. J. H. Teall, Directors of the Geological Survey of India and England, respectively, closely examined the specimens and discussed the mode of origin of the diamonds. Sir William Crookes thought that these Inverell diamonds had probably been formed originally under absolutely non-oxidizing conditions, such as would prevail if the surrounding material had been metallic iron. He pointed out that diamonds had already been found in nickel-iron in the case of the Cañon Diablo meteorite of the United States. He also referred to Moissan's experiments in Paris, which had resulted in the successful artificial manufacture of microscopic diamonds by the action of metallic iron on carbon, the melted iron, with carbon in the form of sugar charcoal dissolved in it at a high temperature, being cooled in such a way as to set up an immense pressure on the carbon when the latter was in the act of solidification.

The following arguments were brought forward in reply to Sir William Crookes:

1. Dr. Friedlander, of Berlin, had succeeded in manufacturing microscopic diamonds, not by means of metallic iron, but by means of a magnesian iron-silicate—olivine—in chemical composition not very dissimilar to the hornblende-diabase of Inverell. He had formed his small diamonds by stirring molten olivine with a small stick of black lead pencil. Dr. Friedlander's experiments had been amply verified, and they proved that diamonds could be formed under conditions where, as in the case of the silicates, oxygen was present.

2. Diamonds had been found in the Novo-Urei meteorite of Russia, and this was not an iron meteorite, but one largely formed of silicates.

On the whole, the general opinion seemed to be that the hornblende-diabase might very well be the original matrix rock of the diamond in New South Wales, and it was not necessary to assume that the diamonds had in the first case been formed deep down beneath the earth's crust in masses of metallic iron which had subsequently been dissolved in the hornblende-diabase. At the same time the strong corrosion of the surface of one of the diamonds proved that it had been floated up from some depth below in the hornblende-diabase and had suffered corrosion in transit, much as the crystals of quartz in a rhyolite lava show evidence of having been corroded by the matrix in which they are enclosed.

These specimens of Inverell diamonds were also exhibited by me at the International Geological Congress at the City of Mexico last month. Dr. Friedlander, of Berlin, was present on the occasion, and thought that the hornblende-diabase of Inverell was the original matrix of those diamonds.

Up to the present about 80 tons of material from the hornblende-diabase have been examined, with the result that only four small diamonds, whose aggregate weight is only about two carats, have been discovered, so that the discovery has so far not led to a remunerative industry.

Messrs. Pike and O'Donnell are now prospecting neighboring dikes in the hope of discovering portions of them in which the diamonds may have been more concentrated than they have proved to be in the original dike.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A deed conveyed an undivided interest in the Slap Jack mine, and another deed described a mine known as the Jim Blaine mine, located by W., the boundaries of which coincided with the Slap Jack mine. The grantee in these deeds executed a mortgage in which the property is described as the Jim Blaine mining claim, being the same property located by W. on January 1, 1899, "of record in book 10, p. 271 Quartz Claims, Tuolumne County Records." After the execution of such a mortgage it was determined that the location of the Jim Blaine mine was ineffectual and that the deed to the mortgagor to such mine conveyed nothing. But it was held that the description in the mortgage was sufficient to pass the interest acquired by the mortgagor in the Slap Jack mine. The court said that the description used in the mortgage was intended to identify the property mortgaged by reference to documents which referred to the same property as was referred to in the deed of the mortgagor; and as the Jim Blaine mine embraced precisely the same ground, there could be no mistaking the intention of the mortgage to include this ground; that the purpose of the description of the property mortgaged or deeded was to identify the property, and not to indicate the source of the title; that property in a deed or mortgage may be sufficiently described by appropriate reference to any duly recorded document or public record containing the required description, and that proof of the description was completed by the introduction in evidence of such document or record.

Wemple *v.* Yosemite Gold Mining Co. (Cal.); 87 Pac. 280.

It was decided that a mining claim was not subject to the location by the complainant on the ground that the adverse parties, who were prior locators of the claim, had failed to do the required amount of assessment work for a certain year, where it was shown that such required work was not completed for the reason that the complainant had caused the servant of the prior locators to quit work and leave the claim by threatening him with arrest if he continued the work. The court said that a locator was entitled to protection in the possession of his claim, and could not be deprived of his rights by the tortuous acts of others; nor can an intruder or trespasser initiate any rights which would defeat those of any prior locator; that the complainant was an intruder and trespasser, with actual knowledge of the locator's possession; that he intended to and did prevent further work of the locator. The court applied the maxim that no man can take advantage of his own wrong, and stated that on this maxim rested the rule that he who prevented a thing from being done should not avail himself of the non-performance he has himself occasioned. The court in this case declined to follow any decisions which held or seemed to hold that the prior locator in such instances should persist in his efforts to perform the required work until prevented by the apprehension of imminent physical violence.

Garver *v.* Elder (S. D.); 109 N.W. 508.

The failure of the first claimant to complete his location after posting his preliminary notice inures to the benefit of a junior locator whose claim is in conflict with such older claim, when the inchoate right acquired by the discoverer and the posting of the notice never became fixed by a completion of the location.

Helena Gold &c. Co. *v.* Baggaley, (Mont.) 87 Pac. 455

The constitution and statutes of the State of Pennsylvania make all railroads, public highways, and railroad companies common carriers; and under the constitution and statutes, the Court of that State held that the owner of coal-mining property adjoining the right of way of a railroad was entitled as a matter of right, to connect the switch tracks built on his own land with the tracks of a railroad company in order to facilitate the loading and shipping of coal.

Olanta Coal Mining Co. *v.* Beech Creek R. Co., 144 Fed. 150.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Kokomo, Colo., is Quartz-feltzite with dendritic stains.

The mineral from B. F. W., of Battle Mountain, Nev., is black Hematite, the oxide of iron.

The mineral from J. C. W., Prescott, Ariz., is Wulfenite (molybdate of lead) with Vanadinite (lead vanadate).

The grayish mineral from T. C., of San Francisco, is simply Quartz colored with a little carbonaceous material.

The mineral specimen from Eureka, Nev., marked J. P., is Limonite coated with crystals of ferruginous quartz.

Rocks from G. M. & T. Co., of Oregon, are: No. 1 contains manganese oxide; No. 2 is Rhyolite; No 3, Rhyolite tuff.

F. C. D., of Sierra county, Cal., has sent: No. 1, Talc schist; No. 2, Gneiss or schist altered to a mixture of talc, serpentine, and clay, with some limonitic stains.

The specimens from N. Yamhill, Ore., are: No. 1, Feldspar-porphyry; No. 2, decomposed volcanic rock with malachite stains; No. 3, Rhyolitic tuff containing pyrite.

The rocks sent by J. W. A., of Los Angeles, are acid volcanics and are slightly different phases of the same rock, namely, rhyolite or rhyolite porphyry. The ore specimens are mostly brecciated rock stained with green malachite (copper carbonate) and crysocolla (copper silicate).

MALAY TIN OUTPUT.—The following table gives the output of all the tin-bearing States of the Malay peninsula for the first nine months during the years 1905 and 1906, expressed in tons of 2,240 pounds:

	1906.	1905.
Perak	19,271	19,740
Selangor	11,975	12,889
Negri Sembilan	3,452	3,738
Pahang	1,515	1,502
Total	36,213	37,869

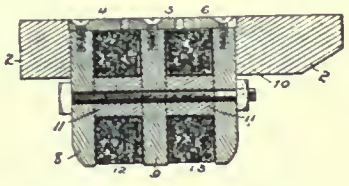
According to the market reports of shipments from the Straits Settlements for the first nine months of 1906, there was shipped 43,262 tons, or 7,049 tons more than the reported output of the mines. This shows conclusively that there was a large amount of tin on hand, held back to control the market and take advantage of the higher prices that have prevailed recently.

EDUCATION is from its very nature never complete, for the variety of natural phenomena is everywhere endless, and education (in so far as its goal is the mastery of these phenomena) must also be endless. An education which claims for itself completeness characterizes itself at the outset as a sham education. A completed education appears possible only when one restricts it to a very narrow field, and arbitrarily shuts out everything beyond this field as not belonging to education. The application of this statement to concrete cases may be left to the reader.

MINING AND METALLURGICAL PATENTS.

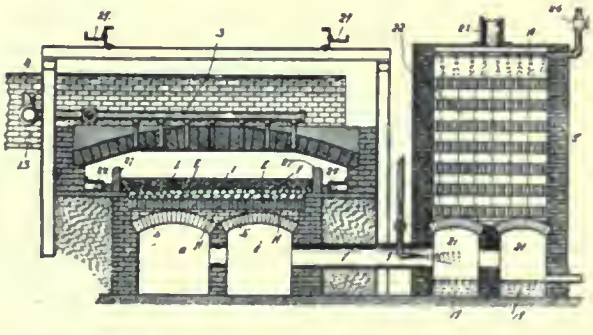
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MAGNETIC SEPARATOR.—No. 837,994; James C. Winder, East Point, Ga., assignor to E. Van Winkle, Gin & Machine Works, Atlanta, Georgia.



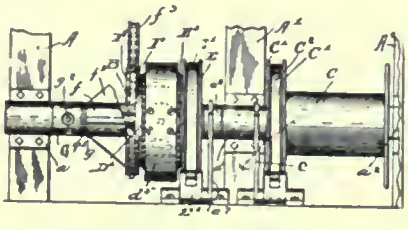
In a magnetic separator, the combination with a support of non-magnetic material having slots, and three magnetic bars spaced apart and sustained by said support, of a magnet comprising three plates projecting through the slots in the base and secured respectively to said strips, thimbles separating said plates, helices wound on said thimbles to energize the central plate with one polarity and the end plates with the opposite polarity, and means securing said plates, thimbles and helices together.

POROUS-HEARTH FURNACE.—No. 839,064; John E. Greenawalt, Denver, Colorado.



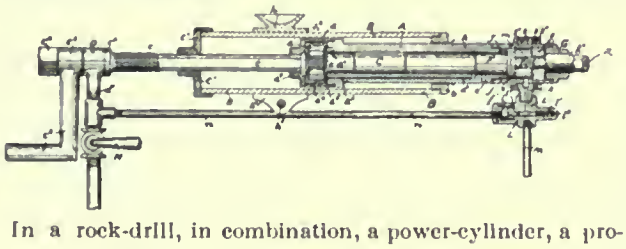
In a furnace for treating ore or other material, the combination of a porous bed or hearth, and means for passing air or gas downwardly through the material and the hearth upon which it rests.

HOIST.—No. 838,655; James R. Sharp, Chicago, Illinois.



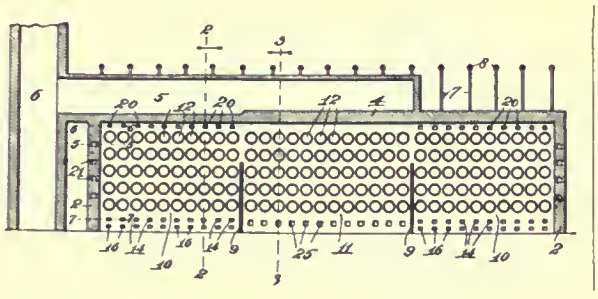
The combination with a drum-shaft of a drum thereon, a friction-brake engaging the drum, a gear-case rigidly secured on the shaft, a plurality of beveled pinions engaged therein near the periphery and projecting beyond the faces of the wheel, a continuously driven sprocket rotative on the shaft, a beveled gear thereon positively engaging said pinions, a controlling-gear on said shaft meshing with said pinions and a friction-brake therefor whereby retarding of the controlling-gear acts to rotate the shaft at a rate dependent upon the retardation.

ROCK-DRILL.—No. 839,586; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



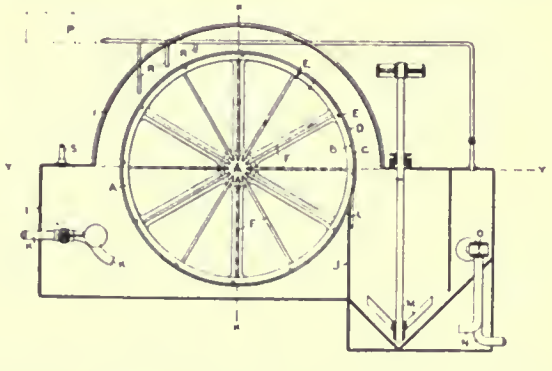
In a rock-drill, in combination, a power-cylinder, a protecting-casing in which the power-cylinder is slidably fitted, a reciprocating piston arranged in the cylinder, means fitted in the forward end of the cylinder for supporting the drill-bit so that the same has longitudinal movement in said means, means for rotating the drill-bit in unison with the power-cylinder, and means for advancing or receding the power-cylinder in its protecting-casing substantially as described.

ZINC-SMELTING FURNACE.—No 839,160; William Lanyon, Iola, Kansas.



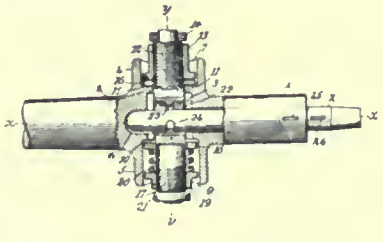
A zinc-furnace, constructed with a centre wall in which is formed a flue, means whereby air and gas are delivered into the ends of said furnace, and means whereby the air and gas during combustion are caused to pass upward between the retorts in the ends of the furnace, downward between the retorts in the centre of the furnace, and thence outward through the flue in the centre wall, substantially as specified.

CONTINUOUS FILTER FOR SLIMES, SANDS, &c.—No. 839,591.—Erle S. Huntley, Coolgardie, Western Australia.



A filtering apparatus comprising an air-tight chamber, a rotary member therein having filtering material on its outer surface, means for supplying air under pressure to said chamber and means for withdrawing the filtered material from the said rotary member.

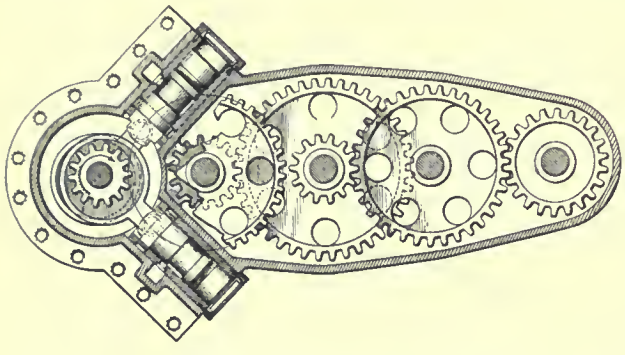
DRILL-CHUCK.—No. 838,638; Peter McKay, Day Dawn, Western Australia, assignor of one-fourth to William Hill and one-fourth to William Harrison, Day Dawn, Western Australia.



A drill-chuck comprising a tubular portion for receiving a drill or boring-tool, a chamber at the inner end of the opening of the tubular portion, a yoke or ring arranged in said chamber, an annular rib carried in said yoke or ring for engaging in a channel formed in a drill or boring-tool, threaded extensions from said yoke or ring, a clamping-nut on one of said threaded extensions, a nut on the other said extensions, and a spring surrounding said other extension.

The Little Giant Corner Drill.

The Chicago Pneumatic Tool Co. has just manufactured a new drill for corner work. From past experience in air-tool practice, they are enabled to state that this new drill surpasses any other yet devised for drilling in close quarters and in corners particularly. This new tool weighs but 35 lb.; capacity 1¼ in. (but in emergency cases will drive 2 in. twist-drills with satisfactory results); spindle speed when



New Drill for Corner Work.

runnnig light 150 r.p.m.; under load with 80-lb. air-pressure, 100 r.p.m.; distance from end of socket to end of feed-screw when run down 5⅞ in.; length of feed 2 in.; distance from centre of spindle to outside of housing 1 5/16 in. In addition to the fact that it is the most powerful drill ever devised, weight considered, it possesses advantages over other designs of corner drills, owing to the spindle being driven by gears instead of a ratchet so as to insure steady and constant spindle movement.

Electrical Equipment for Iron Mines.

The new power-plant which Witherbee, Sherman & Co. are erecting on the Lake Champlain shore at Port Henry, New York, furnishes an interesting example of the application of electricity in mining. It is not generally known that the lower Champlain Lake region produces a goodly proportion of the United States annual supply of iron ore. The various shafts of this company alone yield from 500,000 to 600,000 tons of iron ore yearly, while with the new electrical equipment the ultimate output will be 1,000,000 tons.

Owing to the fact that the principal shafts of the mines are scattered over a large area, electricity has been found to be the most flexible form of power transmission and is almost universally used. Power for this purpose is generated at present both by water and steam. At Mineville there is a steam plant with a 750 kw. engine-driven generator, which supplies current at 3,300 volts for local distribution. This power is supplemented by two small water-power plants; a 300 kw. water-wheel driven generator unit at Wadham's Mills, and a 370 kw. unit at Kingdom. At Wadham's Mills, a Morgan-Smith water-turbine is used, operating under a 48-ft. head. Power at the Kingdom plant is furnished by a Pelton impulse wheel under a head of 290 ft., water being carried through a 32-in. pipe a distance of 1⅛ miles from the reservoir. These stations are situated about 11 mines from Mineville and deliver current at Mineville at a potential of 6,000 volts. This voltage, made desirable because of the saving in transmission, is stepped down to 3,300 ft. at Mineville and is used in conjunction with the 750 kw. 3,300 volt steam-driven machine to supply power at the various shafts. Induction motors are used for driving hoists, pumps, air-compressors, etc., operated at 25 cycles and 440 volts.

The power-house which is being built at Port Henry is six miles from the mines, and will be interconnected with the other sources to supply the increasing demand for power. The station is to be thoroughly modern, being built of monolithic re-inforced concrete. Steam will be generated by four 500-h.p. Babcock & Wilcox boilers, arranged in pairs on either side of a 175-ft. stack. The boilers are hand-fired, and coal is conveyed to each by a car on a track running the length of the building. This car is filled from an over-head hopper through a hinged chute. The hopper is filled by a vertical bucket-conveyor that carries the coal from a pit filled directly from cars outside the building.

The generating equipment comprises an 800 kw. Curtis steam-turbine generator, which will deliver current directly to the line at a potential of 6,600 volts and 25 cycles. The compactness of the vertical unit has permitted a remarkably economical disposition of machinery in the generating room. Space is left for the installation of a second turbine. The switchboard is placed in a gallery with a re-inforced concrete floor. On this floor is placed also the motor-driven exciter set, and space is available for two frequency-changer lighting sets. A supplementary exciting unit is provided by a 25 kw. horizontal Curtis steam-turbine generator. The entire electrical equipment for this power-house will be furnished by the General Electric Company.

Canda Tempered Steel Jaw-Plate.

The Chrome Steel Works, of Chrome, New Jersey, are placing on the market an improved wearing plate for the Blake type of rock crushers, consisting of a combination of forged and rolled chrome steel bars, (forming the corrugations) inserted into a backing of tough open-hearth cast steel. The plate is constructed by placing into the mould, side by side, the forged steel bars, forming the wearing face, and casting the soft steel back around these bars, interlocking and cast-welding the entire back of the

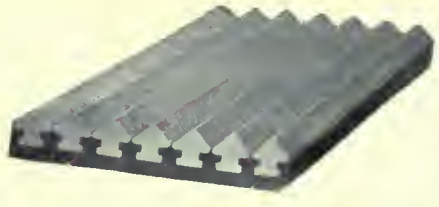


plate to the bars. The face of the plate is afterward tempered to the desired degree of hardness. By this method of construction, a plate of this. kind can be readily tempered, whereas if forged from one piece, it would be a very difficult matter to temper such a high-grade steel, without the plate breaking during the tempering process. The tough open-hearth steel for the backing is of such a low carbon that it does not take any temper whatever, thus a plate combining both extreme hardness and toughness is obtained. The accompanying illustration shows how the chrome steel forged bars interlock with the plate. These bars are finished in several sections, so that plates for any size Blake-type of crusher now in use may be conveniently constructed at moderate cost. The Chrome Steel Works are represented on the Pacific Coast by George W. Myers.

Commercial Paragraphs.

W. A. BUTCHART is resident manager for the Mexico Mine & Smelter Supply Co. at Mexico City.

A. LESCHEN & SONS ROPE CO. received an order for two hawsers and 300 ft. of patent flattened strand Hercules hoisting rope from the Arctic explorer, Lieut. Commander R. E. Peary.

The Tomboy Mining Co., operating at Telluride, Colo., recently placed an order with L. S. PIERCE, 1650 Champa St., manufacturer of the Pierce amalgamator, for one 30-ton, 17-riffle machine, and thirteen 25-ton, 25-riffle machines for use in their mill. The Smuggler Union mill has 13 of the Pierce amalgamators and reports the saving of several thousand dollars each month below the plates that heretofore was lost.

THE UTAH MINING MACHINERY & SUPPLY CO., of Salt Lake City, has secured the following orders from the American Smelters Securities Co., the machinery to be used in the new concentrator for the Nevada Consolidated Copper Co., at Ely, Nevada: Twelve 24-in. belt duplex Callow screens and 140 8-ft. Callow tanks, this order being in addition to the order for two screens and 68 tanks placed previously.

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Editorial.

THE DIVIDENDS distributed in the United States during January are estimated to aggregate $206,000,000, a sum $50,000,000 larger than the previous best. Payments by railroads account for $51,279,602, as compared to $28,513,284 in the same month last year. But this does not include interest on bonds, which makes a further sum of $69,816,411. Industrial companies contributed $35,690,170 in dividends, an increase of $10,282,934; also $26,070,646 in interest on bonds. Traction and lighting companies are put down for $20,027,854, an increase of $8,014,353. Bank, trust companies, and similar corporations swelled the total. The figures afford eloquent confirmation of the prosperity of the country.

THE MINE MANAGERS of Western Australia, recently in conference, have been discussing seriously how best to encourage such successful prospecting as may compensate for the exhaustion of the big mines. It was proposed to give prospectors special privileges as to getting title to claims, remitting rents for the first year, and affording time to prove the character of their discovery. Monetary grants were deprecated, as having proved unsuccessful. All of which is interesting, but the best inducement to the prospector is the chance of a rich find and there is no incentive so powerful as the hunger for gold. A fair field and no favor is all the genuine prospector asks.

THE TENDENCY to exaggerate during times of speculative elation is shown by two statements appearing in the daily press this week. According to one of these Mr. Chas. M. Schwab has built "a huge mill in the Bullfrog district," this plant "will deal with 5,000 tons of ore a day" and "it is the largest of its kind in the world." It would be easy to make a bigger mill, for neither time nor money would be required, only a riotous imagination. The brutal fact is that the plant referred to will have a capacity of between 100 and 200 tons per day, and it is not yet completed. Another newspaper—a San Francisco daily—stated that "thirteen cars loaded with Goldfield ore, valued at $7,000,000" have arrived at Sacramento. Is it to be distributed among the members of the Legislature now in session? Apparently, they could find use for it. The fact is that the whole of Nevada produced $9,800,000 during the past year, and a shipment of $7,000,000 in one day would indeed startle the world. Goldfield is producing rich ore in quantity just now because the clean-up of the Mohawk leases is being marketed, but such childish statements as those quoted tend only to provoke suspicion of all news emanating from Nevada.

ANOTHER CHAPTER in the story of the Fresno Copper Company has been written, for the report of Mr. J. S. MacArthur has been published. By careful sampling, he finds that the body of pyrrhotite ore in the existing

workings averages 1.26 per cent, as compared to the 1.33 obtained by Mr. F. J. Siebert. But we are not among those that consider the lowest average necessarily the most correct and in this case it is to be noted that Mr. MacArthur's figure was reached by adding the average percentage on one level to that secured on the next and then dividing by two, instead of getting a mean figure based upon the proportionate quantity of ore involved in the calculation. However, Mr. MacArthur and his assistant took 600 samples, as against Mr. Siebert's 100, and in such estimates multiplicity of sampling is a factor of strength. It is fortunate for the shareholders and satisfactory from a professional standpoint that two engineers should arrive at a result so nearly identical. With the characteristic pluck of British shareholders, the Scotchmen who suffered by this fiasco have decided to sink the shaft and develop the mine. It is proposed to evade the smelting problem and to decrease the cost of treatment by adopting a wet process, that is, roasting succeeded by lixiviation, as is done in Spain. We do not know how much the people of Fresno want a copper industry in their midst and we are not informed concerning the feelings of the Fresno farmers, but we would advise the company to proceed slowly, for sulphur fumes are not properly appreciated by the agricultural population, and a brave effort to resuscitate a crippled enterprise may meet with scanty consideration at the hands of the surrounding community.

WE PUBLISH a plain statement concerning the working of the so-called 'black sands' in California. On a previous occasion we have deprecated the exaggerated expectations formed from certain experiments made by Dr. David T. Day, of the United States Geological Survey. In a circular letter sent out by the press department of the Jamestown Exposition, we note the following heading: "Fortunes in Sand Dunes. Deposits contain unrevealed wealth in precious metals and valuable ores Working plant at Jamestown Exposition to make analytical tests." We find by reading further that a concentrating plant is to be erected at the Jamestown Exposition, which is to test the gravel of placer deposits and the "pulp from deep mines." It is stated that "many of the gravel and sand deposits, besides precious metals, contain such minerals as magnetite, chromite, ilmenite, monazite, garnet, crysolite, zircon, quartz, etc., all of which have a decided commercial value. The results of these tests are invaluable, as was proved in the case of the sands of the Pacific Coast, and the precious metals and minerals discovered have been the means of developing several new industries." Concerning which we do not hesitate to say that it is absurd quackery and pseudo-scientific bunkum. Of course, the efforts of the Survey in this direction are well meant, but the work done at the Portland Exposition simply afforded the basis for a lot of fraudulent schemes and a mass of rubbishy writing concerning the untold wealth existing in a familiar type of alluvial deposit. We hope the farce will not be repeated at Jamestown. It is making the Survey ridiculous. In this connection we desire to express cordial agreement with our contemporary at New York, which says in a recent issue that the problem of rendering the black sand profitable "is an engineering problem rather than a geological or metallurgical," and for this reason it is best left to private enterprise, which will be quick enough to solve it if there is any money to be made. The Geological Survey will do well to keep out of such matters, which are beyond its proper scope.

The Production of Precious Metals in the United States.

Herewith we publish the statistics exhibiting the output of gold and silver in the United States during the past year, with those of 1905 to serve as a basis of comparison. Our authority is the Director of the Mint. It is necessary to explain further that the 1905 figures are the revised data published by the Director of the Mint late last year, while those for 1906 were furnished by him to the press on January 10. The Director, Mr. George E. Roberts, usually gives out preliminary estimates on January 1, and publishes a final statement about nine months later, when all the necessary corrections have been made. Last year his first estimates of gold production remained practically unchanged, but he modified those for silver, decreasing the total by 2,800,000 ounces and making one or two important changes of detail; for instance, Utah's yield was cut down from 12,000,000 to 10,319,800 ounces and Arizona's from 3,400,000 to 2,605,700. This year he gave two sets of preliminary figures, the first of these appeared in the columns of our New York contemporary. The total was therein given at $97,155,201 for gold and 57,358,267 ounces for silver. A week later came the figures that we now quote; in these the total of gold is about one million dollars less and that of silver 1,174,767 ounces less. The principal changes, as regards gold, are that California is credited with $500,000 more, while Colorado, Montana, and Utah get $800,000, $570,000, and $675,000, respectively, less than in the first estimate. This indicates that all the necessary data were not available on the first day of 1907 and that corrections were made almost immediately thereafter. This explanation has been deemed necessary to make clear the cause of discrepancies that otherwise would be confusing.

It will be observed that in 1906 the United States produced $7,920,700 more in gold than in 1905. The increase is due mainly to Alaska, with a gain of $6,325,000, and to Nevada, with a gain of $4,450,000. Arizona exhibits an increase of $530,000. On the other hand, there is a falling off in Colorado of $3,000,000, and in California, $500,000. It is most probable that the Alaska total is too high, for a great deal of the Klondike gold is shipped to the banks of Seattle and elsewhere, so as to be credited to Alaska instead of Canada. We expect to see a correction of at least $4,000,000 in the Director's estimate. Even allowing for this, there will be a handsome gain, which is due mainly to the Tanana region. At Nome, the building of ditches and systematic operations on a large scale are winning an output from the bench alluvium, so as to compensate for the diminishing yield from the beach deposits that made the locality famous. Nevertheless, it is probable that as hydraulicking enterprise

get under way in the Tanana country, the output of gold will make this region much the most important in Alaska. The dredges at Dawson ought to contribute this year. The increase in Nevada is less than the public expected, but the estimate is probably just, for the production of Goldfield was not augmented until the closing months of the year, and much of the richest ore was not marketed until 1907 had arrived. The present year, which begins with a great clean-up of the bonanza leases, will undoubtedly advance Nevada to the first rank of gold-producing States, and bring it more nearly level with the three leaders — Colorado, Alaska, and California. Colorado barely holds first place, and appears destined to be excelled by Alaska, for there is no reason to expect an increased yield from Cripple Creek or any of the older goldfields. In Colorado, gold mining is in a healthy condition, but no new districts have been discovered lately, so that the lower grade of the ore extracted tends to decrease the aggregate production, despite new enterprises that betoken vigorous development and the promise of profitable activity. Similar generalizations will hold true of California; the industry is prosperous, but the old districts are producing lower-grade stuff; alluvial mining is decadent save for dredging, the yield from which is increasing, but it is not much more than enough to offset the diminishing production from other forms of gravel mining. Copper mining is expanding, and the smelting of copper sulphides is stimulating the production of silicious ores containing gold; this factor is of some importance. South Dakota exhibits a steady output, but the bulk of it comes from the Homestake mine, and there is no evidence of any expansion in the gold mining industry. In Utah, the yield is estimated to be without change, for while the Bingham copper mines have been producing on a larger scale, and therefore yielding more gold, as a by-product, the purely gold mines, such as those of Mercur, have been retrograding. Much the same is true in Montana; a quarter of the output is won as an incident in copper mining at Butte; this contribution is fairly constant, but the gold extracted from quartz veins has diminished. Idaho is wonderfully prosperous just now, and the Cœur d'Alene region is being explored so vigorously that an increase is likely to be shown during the current year. On the whole, prospects are good for a further increase of gold production in the United States, for Nevada and Alaska will augment their yield appreciably, more than enough to balance any slight decrease in Colorado and California. It is likely that 1907 will reach a record of one hundred million dollars.

GOLD PRODUCTION.

State.	1905. $	1906. $
Alaska	14,925,600	21,251,100
Arizona	2,691,300	3,223,800
California	19,197,100	18,633,900
Colorado	25,701,100	22,771,200
Idaho	1,075,600	1,093,700
Montana	4,889,300	4,585,800
Nevada	5,359,100	9,815,800
New Mexico	265,800	255,900
Oregon	1,244,900	1,369,900
South Dakota	6,913,900	6,822,700
Utah	5,140,900	5,172,200
Washington	370,000	352,600
Other States	406,100	752,800
Total	88,180,700	96,101,400

In the mining of silver there is neither loss nor gain; despite an average price of 66 cents for the metal during 1906 as compared to 60 in 1905, the output remains stationary. However, there are some slight changes of detail. Montana produced 2,000,000 oz. less, for causes parallel to those that affected its gold yield. While the silver that comes from the copper ores of Butte has decreased slightly in amount, as did the copper in 1906, there was also a diminution from other sources, namely, the gold-silver ores. Colorado had a small decrease that balanced the gain of Arizona. Utah gained notably, as did Nevada; the first shows an increase of 1,240,000 and the second, 900,000 oz. In both cases this was due to the mining of another metal. The copper ores of Bingham contain precious metals, which are separated in smelting, and it is the growth of Bingham that is making Utah richer in silver. As to Nevada, it is too easily forgotten that the ores of Tonopah and Goldfield, like those of the Comstock, contain about as much gold, in weight, as silver. Therefore the silver output of Nevada may be expected to increase in 1907. Colorado remains at the head of the silver producing States, as she has been ever since the development of Leadville and the wane of the Comstock, twenty-seven years ago. In 1905 Montana for once was a little ahead, by reason of the by-product silver of Butte, but in 1906 the Butte mines yielded about 12,500 tons less of copper and this affected the silver output also. It is not likely that Colorado's production will increase; it is dependent largely on favorable smelting conditions, as they affect the low-grade fluxing ores of Leadville, Aspen, and Creede. The mining of low-grade ores in old mines is being stimulated by the rising price of silver and by the nursing of smelting conditions by the monopoly in Colorado. These are conditions that are not to be depended upon. It is likely that both Utah and Montana will exceed Colorado in 1907, for both get their silver mainly from a copper industry that is expanding, especially Utah. For these reasons we expect no increase in silver production during the current year.

SILVER PRODUCTION.

State.	1905. oz.	1906. oz.
Alaska	169,200	191,700
Arizona	2,605,700	2,747,800
California	1,082,000	1,564,500
Colorado	12,942,000	12,245,100
Idaho	8,125,600	8,273,300
Montana	13,454,700	11,478,700
Nevada	5,863,500	6,742,900
New Mexico	354,900	356,200
Oregon	88,900	100,100
South Dakota	179,000	157,500
Texas	417,200	280,100
Utah	10,319,800	11,538,000
Washington	119,400	140,500
Other States	379,700	367,100
Total	56,101,600	56,183,500

Special Correspondence.

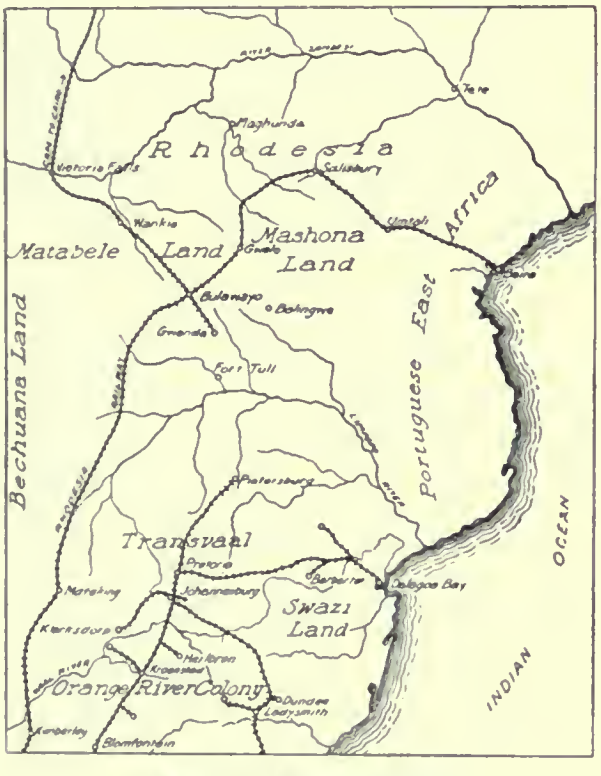
London.

Electric Transmission of Power.—The Victoria Falls Scheme.—Some Criticisms.—Siberian Gold Mines.—Cornish Tin Sales.—Esperanza's Output.—Shortage of Labor.

The closing weeks of the year have witnessed the accomplishment of a financial scheme in relation to mining at once bold in its conception and remarkable in the scope and magnitude of its proposed operation. Under the auspices of the British South Africa (Chartered) Co., the Victoria Falls Power Co. has been formed with a nominal capital of £3,000,000, of which there are one million ordinary shares and two million preference shares of £1 each; 625,000 preference shares have been issued at par. Subscriptions for an issue of £625,000 depentures at 95% have been guaranteed conditionally on the full allotment of the present issue. These depentures will form part of an authorized issue of £3,000,000 depentures, redeemable in 30 years at 10% premium. A strong board has been formed with the Marquis of Winchester at its head. Lord Kelvin heads the list of the advisory board of engineers. The company pays the African Concessions Syndicate £1,000,000 in fully paid ordinary shares and £120,000 in cash for the interests that it has agreed to sell and the Company will acquire the preferential right to develop 250,000 e.h.p. at the Victoria Falls and the exclusive right to deliver power from the falls to the Transvaal, for a period of 75 years. It also acquires as a going concern the plant and undertaking of the General Electric Power Co. at Driehook. It is intended to begin with 24,000 h.p., aud to extend operations at a later date. The Witwatersrand is described in the prospectus as "the market for power," and customers are ready directly the Company is in a position to supply them, and these include the Consolidated Goldfields Co., Eckstein & Co., and the Albu, and Lewis & Marks group. At Vereeniging, arrangements have been made with Lewis & Marks for the exclusive right to erect an auxiliary steam-driven station. The Falls Power Co. has bought up the existing Rand Central Electric Works, from which a determined opposition was threatened, the price having been fixed at £175,000 preference shares and £175,000 depentures of the new company. The main feature of the enterprise is described as the generation of electrical energy by hydraulic power at the Victoria Falls, and its transmission for the development of South African industries. In addition there will be a steam-driven station on the Rand itself, coupled with a system of hydraulic accumulation. This accumulation is to be accomplished by the extra power transmitted, over and above that which is actually consumed, being used for pumping water to a position where it will be accumulated and will be instantly available for reproduction of electrical power when required. With regard to the steam-driven station on the Rand, it is proposed to proceed immediately with the construction of a 24,000-h.p. station in a suitable position in the neighborhood of Johannesburg and the delivery of power from this station will commence in about two years. The hydraulic power at the falls will be developed by means of a canal, which will conduct water from a point on the northern bank above the falls, and deliver it at a convenient place near the top of the gorge at the first bend below the falls. The water will be taken hence by means of a series of steel ducts, fixed on the slope of the gorge, and delivered to a power-house to be erected near the water's edge some 350 ft. below. It is proposed in the first instance to install machinery at the falls for the production of 50,000 h.p. The main transmission line will be from the power station at the falls to a transmitting station near the Rand, and will probably follow approximately the course of the Rhodesian railway over the greater portion of the distance, some 700 miles. When the scheme was first ventilated in the press it was made the subject of severe criticism, inspired by rivals; but hostile voices have ceased to be heard since the settlement with Lewis & Marks in respect of the power site at Vereeniging, and with the Rand Central Electrical Works. As a forecast for future comparison, Robert Hammond's comment may be worthy of record. He says: "The transmission line, 700 miles in length, would necessitate such heavy expense for protection and maintenance that the company could not compete with supplies of power on the spot. Over 80% of the electrical energy produced at Niagara Falls is utilized within easy distance. It does not pay to use it in New York, which is only 480 miles away, and where coal costs much more than in the Transvaal. In order to ensure continuity of supply, the Victoria Falls scheme has to make duplicate and triplicate provision against breakdowns at huge expense and in face of great engineering difficulty. For the big supply of water required in connection with these provisions against breakdown the company will have to pay as high a price as 3s. 6d. or 3s. per 1,000 gal. Whereas the company itself seems to estimate that it can reduce the charge for energy in the Rand to 1.322d. per unit, it will be necessary to supply at less than one penny per unit to make it worth the while of the mine-owners to substitute electric power for steam-power." Sir A. B. W. Kennedy adds his protest on behalf of the Rand Central Electric Works (before it was bought out) concluding a long statement to the press by expressing the hope "that an engineer's view of the hopeless finance of the scheme, apart altogether from its special engineering difficulties and possibly fallacies, may perhaps prove a useful counter-active to the fascination which anything sufficiently big and sufficiently distant seems to exercise on the public."

One of the leading London companies operating in the Russian Empire, the Siberian Proprietary Mines, has issued its first report, covering the period from the inception of the concern on August 8, 1905, to November 30. The accounts show a "net profit on sale of mining options" of £422,657, and a credit balance to Profit & Loss of £417,097; while at the date of the balance sheet the company possessed £48,600 in cash. During the period covered by the report two subsidiary companies have been formed, namely, the Orsk Goldfields, with a capital of £600,000 in £1 shares, of which 500,000 shares, credited as 15s. paid, were issued to the Siberian Proprietary Mines as consideration for its services; and of these shares, 249,000 have been disposed of to the H. O. Siberian Syndicate "on terms which resulted in the whole of the issued capital being fully paid up without recourse to the available funds of this company." The other subsidiary is the Troitzk Goldfields, also with a capital of £600,000 in £1 shares, whereof 500,000 credited at 14s. paid, were issued to the parent company in payment for its services. As in the previous case, 249,000 of these shares have been disposed of to the H. O. Syndicate. The balance of 251,000 shares in each of these companies still held by the Siberian Proprietary Mines has been taken into the balance sheet at par, whereas the market quotation for the Orsk Goldfields issue is about 2½, and for the Troitzk about 1¾. The report gives details of numerous properties that the company is either working or investigating, and in order to carry out the program which the directors have in view, it is proposed to increase the capital from £100,000 to £135,000, by the creation of 35,000 new £1 shares, of which 16,000 are to be offered at a premium of £11 10s. to the existing pro-

prietors in proportion to their holdings. A glance at the balance sheet shows that notwithstanding the large balances of profit over £400,000, the Company's available cash is £48,600, little more than the total of premiums received on the issue of the Company's own shares. There is ample food for reflection in such a financial situation, as against the big premiums quoted for the parent company's shares, as well as for the shares of its two off-springs. Regarding these off-springs, the chairman gave some particulars at the annual meeting. It appears that the operations of the tributers on the Orsk Co.'s property for the past nine months have resulted in the milling of 12,225 tons of ore and an extraction of 6,694 oz. bullion, worth about 72s. per oz., exclusive of tailing, which probably contains one-third of the total gold. This does not serve to indicate what the Company will do when it settles down to work. The significance lies in the fact that the ore was derived from 12 different centres, from which a much larger tonnage will eventually be drawn. In addition to the returns as mentioned,



Map of the African Goldfields.

1,634 oz. gold were extracted from an alluvial deposit discovered since the property was taken over, and good results may be anticipated from this source when operations are resumed in the spring. Another alluvial deposit having been uncovered recently, improved returns may be expected almost immediately, as six new Chilean mills are in course of erection. Shaft-sinking at different points is reported. With regard to the Troitzk Co., work of a kind has been in progress on this property for a much longer period than at the Orsk. There are eight shafts sunk on the lode, with a varying depth of 300 to 450 ft., and the orebodies run in the deepest workings from 3 to 10 ft. Two main shafts in the eastern part are to be re-equipped forthwith, and sunk deeper as soon as more powerful pumping engines and machinery have been obtained. The main lode is proved for a length of more than 3,000 ft. The present workings are confined to a length of about 1,500 ft., but on the remaining 1,500 ft. tributers have worked to a depth of 100 ft., leaving the ore below untouched. A third new main shaft has been commenced on this portion of the property, and is already down 70 ft. Three lodes on an entirely new vein are being opened up on the Troitzk, and these at a depth of 150 ft. are reported to be in good ore, 5 to 10 ft. wide.

At the Cornish tin ticketing last week South Crofty, as promised, made a first appearance with a parcel of 18 tons. In a paragraph headed "Record Price for Dolcoath Tin" the *West Briton* remarks that the average price of the 259¾ tons sold this week at the ticketing at Redruth was about 12s. per ton lower than a fortnight before. The 65 tons of best tin from Dolcoath, in four parcels, sold at from £1 to 5s. per ton above the prices then made, this tin realizing from £122 7s. 6d. to £123 5s. 0d. per ton. The sale was one of the finest for a very long period in Cornwall, the total value of black tin sold in less than two hours being £25,452. Competition between the buyers was keen. Mines using magnetic separators did not realize such good prices as Dolcoath, Wheal Grenville, Levant, or West Kitty.

November returns from the Esperanza (Mexico) are as follows: The mill ran 27 days and crushed 11,590 tons of dry ore; shipped to smelter, 4,873 tons of dry ore; estimated realizable value of bullion produced, $129,317; estimated realizable value of concentrate, $50,718; estimated realizable value of ore shipped to smelter, $427,614—making altogether $607,649; receipts from rents and other sources, $299; total, $607,948. Working expenses, including development, marketing of bullion, and freight and treatment charges on ore shipped to smelter, $224,066; allowance for depreciation of plant, $2,500; consulting engineers' fees and New York office expenses, $2,945, making $229,511; profit, $378,437. Of this there has been expended on construction account, $1,093, and prospecting on Suceso property, $3,066; shipping ore on hand, 1,323 tons. The manager reports a shortage of labor during the month, which diminished the quantity of ore mined. The profit for November being considerably less than that of the previous month, the 'bears' claim justification for their prediction that the rich ore is giving out, and they say now that there will be a further "shortage of labor" in December to account for a still greater falling off in profits. Meantime genuine stockholders are enjoying the prospect of another quarterly dividend of 10s. 6d. per share declared for payment in January.

Cobalt, Ontario.

The Nipissing and the Guggenheims.—Opinions at Cobalt.—Delamar and Thompson.—Interesting Gossip.—The Smelting Situation.—Demand for a Canadian Smelter.—Value of By-Products.

The financial, mining, and atmospheric conditions at Cobalt seem to be improving daily. A rumor is current in the Camp that the Guggenheims have acquired the controlling interest in the Nipissing. Their paraded entrance followed by their mysterious exit has perplexed people here as well as the Canadian investing public generally and many theories have been advanced. Men coming from New York state that Capt. Delamar has disposed of his holdings in the Nipissing, which consisted of 168,000 shares, at an average of $17 per share and the belief seems to be general that the insiders have unloaded. In this connection it has been whispered that as an evidence of good fellowship some of their stock went to the Toronto end at $30 per share. The presence of Capt. Delamar in California, where he has been engaged for some weeks on litigation matters, coupled with the fact that much of the unloading was done through some banking houses on the Pacific coast gave the New York contingent an early intimation that he was selling. It is believed in Cobalt that the Guggenheims are now in control and that they secured the property at a much smaller price than that specified in their original option. It is also believed here that at least two of the original Nipissing holders have nothing to conceal. Col. Robert

Thompson, it is believed, sold his holdings outright at $22 per share to Capt. Delamar when the stock was being sold on the New York curb at about that figure and W. B. Thompson of the firm of Hayden, Stone & Co. is credited with still being one of the large individual owners. In any event the exit of Capt. Delamar is taken as indicative that the Nipissing will be properly mined and that the 'gouging' process will be discontinued. There is no doubt that the Guggenheim representatives, like nearly all the Easterners, came into the Camp with the idea that the Nipissing meant Cobalt. When they took the option on the block of Nipissing stock they believed that the expenditure of possibly an additional $3,000,000 would buy the district outright.

One of the stories current has been that Capt. Delamar had an option on a valuable Goldfield property which the great metal dealers were also after, and when they found that Delamar had the option they concluded that he was relying on his share of the plunder derived from the sale of the Nipissing and thought that by refusing to carry out their option they might hamper him sufficiently to give them a look-in on the property they were mutually anxious to acquire. It is well known in New York that the Nipissing insiders, as before stated, have pretty well sold out, Eugene Myers and Sam Newhouse being mentioned as the heavy purchasers.

The desirability of independent smelters is frequently mentioned in the Camp and W. A. P. Davis of Philadelphia is out strongly for such a proposition. If the people of the district pull together and the Government backs them up by an independent smelter, or by a vigorous supervision and watchful eye over the railways, so that there is no delay in the shipment of supplies and no harrassing of the mine owners, it is believed that the ore can be treated in Canada and the mine owners receive not only the silver value but also that of the by-products. Mr. Davis urges that the ores are at present treated in the same way that they have been treated for the past one thousand years and says that ore can be brought to Toronto cheaper than coal can be taken into the Camp, which will, beyond question, give operators an opportunity to handle the full values contained in the ore as against the present methods requiring loss to owners of the by-products.

To better illustrate, he says that the present purchasing basis for ores from Cobalt is 90% of the silver value alone. This means 90% of the price quoted per ounce on silver on the New York market. The output of the district will show by analysis at least 10% of cobalt, nickel, and arsenic. As the quoted price of refined nickel is 20 cents per pound; arsenic, 5c., and cobalt $2.50 per lb., it is obvious that the mine owners are losing heavily. On a purchasing schedule assuming the nickel, arsenic, and cobalt to be only by-products, a loss per ton can be shown of (on the basis of 10% of 2,000 lb.) 200 lb. nickel at say 20 cents; 200 lb. arsenic at, say, 1 cent, and 200 lb. Cobalt at, say, $1, making a total loss of $242 per ton. Ore now goes in carloads of 20 tons or upward, therefore, a loss is incurred of $4,840 per car. These facts have spread the idea that the ore cannot be properly treated on the American continent. This is a fallacy, for over a thousand years similar ores have been treated in Europe.

Smelting interests, particularly those identified with nickel and copper, have tried to depreciate the importance of the Camp and to depress the value of the mining shares, by the argument that the ores could not be treated. In one day, and on many days, there has been sufficient trading in one well-known stock alone to show that someone is trying to bring about this condition and the question may well be asked what particular interest would be ffected by the production of silver, nickel, and cobalt. Is there any reason for depreciation by the people that are now the principal traders in these metals? Is it possible for other than these subsidiary companies of the United States steel trust to secure nickel at a low price or even at a similar price to that maintained by the trust today?

It is claimed that Toronto affords an admirable site for the location of a new smelter. The labor conditions there are favorable, but the mine owners of Cobalt must unite in the support of any independent smelter, no matter whether it be built at Hamilton or Toronto. The statement is frequently made that the Guggenheims control the smelting situation and that they are directly or indirecely interested in every smelting concern in the United States where the ores of Cobalt can be treated, and that their object today is to control the output of the Camp as well as the plants where the ore can be treated. The present Minister of Mines for the Province of Ontario is a man thoroughly conversant with the conditions prevailing in the Sudbury district. It is a well-known fact that some of the mine owners at Cobalt believe that they do not receive the full values of their ore, but it is equally well-known that there are others who appear to be perfectly satisfied. The smelting situation is a difficult one and in these days of Government ownership of mines and Government ownership of railways in full operation in this Province, would it not be well to have a commission of experts take up the question of the advisability of either a Government smelter or of official encouragment to a Canadian smelter?

Johannesburg, Transvaal.

Eight-Hour Shift.— The White Labor Experiment.— Renewed Discussion.— Unskilled White Labor as Against Chinese.

For some time past there has been a good deal of discussion over the granting of an eight-hour day in the Transvaal. A few mines where the conditions are favorable have adopted the eight-hour shift. These mines are run with two continuous shifts of eight hours each, from 7 A. M. to 11 P. M., giving a period of eight hours for the mine to get cleared of smoke and dust. Because one or two mines are able to work the eight-hour shift, people are beginning to ask for a universal eight-hour shift for the Transvaal. But mines differ. It is quite possible to work the eight-hour shift on a well-developed outcrop property, where exploratory work has practically ceased, and there are a large number of working faces. In these mines the Kaffirs walk down the ladderway to the working places. With newly developed deep-level mines, the conditions are quite different, and it will be impossible to adopt the eight-hour shift without inconvenience and expense. This has become a popular cry, and although there will be considerable opposition, it is probable that there will be a universal eight-hour shift on the mines.

Verily this place is the artisan's paradise. He does less work and gets more pay for it than in most parts of the world. The unhealthy underground conditions are being improved every day, and now with an eight-hour shift, with the same pay, the artisan's lot should be a happy one. Were it not for the fact that the demand for skilled men is strictly limited on the Rand, the improved conditions of the artisan would no doubt attract thousands from all parts of the world.

A letter of great importance on the labor controversy on the Rand appeared in a local paper some days ago. There is a small minority here, lead by F. H. P. Creswell, formerly manager of the Village Main Reef mine, who maintain that the introduction of Chinese was not only a political crime, but not an economic necessity. This school maintains that by the increased use of un-

skilled white labor, and labor-saving devices, it is possible to work the mines as cheaply with the present supply of Kaffir labor, as it is to employ Chinese. Mr. Creswell tried what is known as the white labor experiment while manager of the Village Main Reef mine. For a long time he has been crowing both in England and this country about the great success of his experiment. A long letter from R. Raine, the present manager of the Village Main Reef mine, completely upsets his contentions. Mr. Creswell has been feeding the public on half-truths, which are more dangerous at times than untruths. From Mr. Raine's important document the following facts are taken: "Under Mr. Creswell the wage paid to the skilled worker on rock-drills varied from £11 12s. 4d. to £15 14s. 11d., not much more than a living wage. The white men were very discontented, and left the mine as soon as they found openings elsewhere. Consequently there remained a band of incompetents, which accounts for the high working costs obtaining when Mr. Creswell had charge of the mine, which varied from 25s. 4d. to 26s. 7d. per ton." Mr. Raine abandoned the policy of his predecessor altogether, and ran the mine along lines usually obtaining on the Rand, that is, with a limited number of white men and Kaffir labor. The average wage of the artisan on the Village Main Reef is now about £28, while the wage earned by the rock-drillers on stoping is from £45 to £50. Quite a difference from the £12 to £15 paid under Mr. Creswell's regime. There has been a great change in the class of men employed. At present they are a contented lot, doing as good work as on any mine on the Rand. Although Mr. Raine employs far less white men than Mr. Creswell, the total wages paid per month now is more than £2,000 than formerly. The costs have come down to 17s. 7d. This discussion has shown the impossibility of employing unskilled white labor on a large scale under the present conditions.

Butte, Montana.

East Butte.—Work Resumed in the Anaconda.—Progress in the Coeur d'Alene.—Mining Inspector's Report.—Amazon-Butte.—Zinc Companies to Consolidate.—Raven Shares Rise.—Production of Butte in 1907.

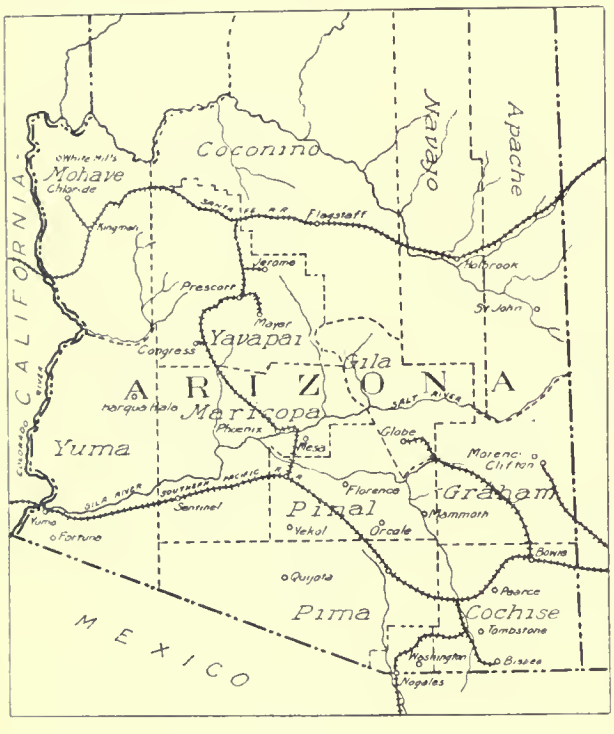
The East Butte Co. (Patrick Wall, general manager), has begun mining and shipping ore on its own account from the veins opened on the 400-ft. level of No. 1 shaft, and it is announced that the output is to be gradually increased. The earnings from this source will be virtually all profit, as the royalties from the lessees on the upper levels more than pay all operating expenses. The company has in excess of $100,000 in the treasury, and the profits from royalties during November and December amounted to about $25,000. No big shipment has yet been made from the company's copper precipitating plant, and about $12,000 worth of precipitate is on hand. The 600-ft. station in No. 1 shaft has been completed and sinking resumed. The shaft will be taken to 1,000 ft. before any further extensive cross-cutting is done. Shaft No. 11, at the southern extremity of the company's developed ground, is going down rapidly, and before long a cross-cut will be started north to connect with the cross-cut No. 1 at the 400. No work is being done in the latter cross-cut at present, as the company is awaiting heavier pumps in anticipation of cutting the big Glengarry vein. It is hoped to begin paying dividends during the coming summer. The big stockholders of the East Butte have so much confidence in the future of the company that they have withdrawn all their stock from the market.

Work has been resumed on the Anaconda mine, which was closed for a week on account of repair work and car shortage. Driving is being done on the vein at the 2,400-ft. level. Cross-cutting for the vein on the 2,400-ft. level of the Neversweat is progressing rapidly, and the company is also driving for the Belmont ground in order to connect with that shaft in the southern part of the district. The connection will result in good ventilation for the Anaconda mine, as the Belmont is a down-cast. The output of the Pennsylvania mine, of the Boston & Montana Co., has been increased about 200 tons of ore per day by utilizing a small engine to hoist ore from the 200 to the 300-ft. level.

A great amount of Butte capital is being invested in the Cœur d'Alene district of Idaho. Robert N. Bell, State Mining Inspector, says the district in 1906 shipped $22,000,000 worth of metals and paid $6,000,000 in dividends out of its few producing mines. "The sensation of the year," says Mr. Bell, "was the remarkable performance of the Bunker Hill & Sullivan lead-silver mine at Wardner. The enormous dividends paid from this property in 1906 probably stamps it as the most profitable metal mine in the West operated through a single entry and from a single orebody. The dividends for the year amounted to $2,340,000, in addition to which there has been developed in the mine within the past 18 months an entirely independent ore-channel, exposing the longest and largest shoot of mineral ever disclosed in the property. The other great silver-lead mines in the Cœur d'Alene are all continuing to show remarkable strength and improvement in their lower levels, and are all developing and opening up new levels at still greater depth. This unusual and interesting condition of permanency, together with the remarkable disclosure in the Snowstorm mine at Mullan of rich copper carbonate and sulphide ore, is the basis upon which an important boom in mining stock values and new development has been started during the year, and is now in progress in the Cœur d'Alene. The most important progress in Idaho's copper mining development during 1906 has been at the Snowstorm mine. This remarkable property has developed bonanza proportions during the past year, and with a light prospecting equipment produced shipping ore and concentrate to a total gross value of $1,200,000 in copper and silver, and paid nearly half of that in net profits. The ore-shoot shows a very indefinite outcrop high up on the steep mountain-side, and has been developed by three cross-cut adits to a total depth of 1,200 ft. Between the No. 2 and No. 3 adits there are four intermediate levels in which there is now blocked out 1,000,000 tons of ore of shipping grade. The shoot is over 600 ft. long and from 5 to 50 ft. wide. Where the sulphide ore is encountered it shows a pay-streak 12 ft. wide, carrying from 10 to 12% copper. The shipping ore, of which there was 80,000 tons sent to the smelters during the year, carries over 90% silica, 4 to 5% copper, and about 5 oz. silver per ton. There are a number of good copper prospects both east and west of the Snowstorm being actively developed at the present time."

A stringer of ore carrying both native copper and copper glance has been cut by the shaft of the Amazon-Butte Co. at a depth of 130 ft. The shaft is now 140 ft. deep, and the ground will probably be cross-cut at a depth of 200 ft.——The Butte & Arizona Co. has taken up the options it held on a group of copper claims in Arizona, the final payment of $50,000 having been made recently. Since the company has held the options, extensive development work has been done and several orebodies opened. The property is situated about 35 miles from Bisbee and the developments have induced the Santa Fe railroad to survey a line to within three miles of the mines, from which point a tramway will be built.

Plans are on foot for the consolidation of the Montana Zinc Co. and the Butte Copper & Zinc Co. Since the destruction of the plant of the Montana Zinc Co., that concern has had no asset except 7,500 shares of Alice mining stock, but the Butte Copper & Zinc Co. owns the Emma mine and some other mining property. On the Emma there is a shaft 800 ft. deep, and if the merger is effected the shaft will be unwatered and sunk deeper, and a large zinc plant will be built at the mine. ——The recent advance in Raven stock on the Boston curb has been in the nature of a surprise to the stockholders in Butte, for they have no information of a change in conditions in relation to the property. It is possible that the Eastern stockholders have agreed on some action since W. Spencer Hutchinson made his examination and report. There is talk about a possible consolidation of the Raven and the Old Glory Co. The latter owns some ground adjoining the Snoozer claim, of the Raven. When the Raven Co. was operating it used the Buffalo shaft of the Anaconda, worked through a cross-cut run through the Old Glory in order to reach the



Map of Arizona.

Snoozer, and mined on a vein claimed by the Butte & Boston Co. as apexing in the La Plata, a claim just north of the Snoozer. That was the peculiar situation when the Anaconda Co. took the Buffalo shaft from the Raven Co. and forced a suspension of operations about a year ago.

Mining men familiar with the situation say it is unlikely that the Butte district in 1907 will exceed the production of 1906, because last year every Amalgamated mine was pushed to its utmost capacity, and the high rate of production that prevailed all the year until hindred by cold weather, and by coal and car shortages, cannot long be maintained. "There is a limit to capacities of shafts and machinery," said an Amalgamated official, "and they were reached during the summer and fall of 1906. Every year makes mining in the big Amalgamated mines more difficult, and while they will be big producing mines for 50 years or more, it is not possible to increase their output much, if at all. On the contrary, it is argued, it is reasonable to expect a constant slight decrease in tonnage of ore. The North Butte Co. may increase its ore tonnage, but its copper output will not show a marked increase, for the average yield of copper per ton of ore is gradually decreasing, because the company is mining more of its second-class ore than it did when it first began mining. Its capacity for production was limited and mostly first-class ore was taken out. With increasing facilities, however, all the ore in the veins will be taken out. The North Butte may open another big mine in the Berlin, but it will be several years before that is done. The Clark mines will produce very much less copper this year than they did in 1906, because they are working in the lean copper zone. If there is to be any increase in the Butte copper output it will have to come from some of the new mines that are being opened by the Butte Copper Co., the Butte & London, East Butte, Butte & Bacorn, and such new companies."

Morenci, Arizona.

Shortage of Coal.—Flood on Chase Creek.—Damage to Railroad and Town.—Development of Outlying Claims.—Shannon Co. to Build a Railroad.—Stevens Group Bonded.—Prospecting for Oil.

At present the big mining companies of this district that are operating reduction works are threatened with a coal famine, the cause being the lack of transportation facilities. The Detroit Copper Mining Co. is now shipping all of its matte to the smelters of the Copper Queen Co., at Douglas, for treatment. They are also engaged in re-smelting the slag from their own slag-dump, in which the average run of copper is about 1½%. All the old converter ovens have been taken out and the ore and concentrate are now treated in the new furnaces higher up the hill.

The big flood on Chase creek on December 3 caused damage to the Arizona Copper Co. at Clifton to the amount of $165,000, mainly by washing out the Coronado railroad, a property of that company, which hauls the ore and concentrate from their mines at Metcalf, Coronado, and Longfellow, and the concentrators at Morenci. The road was not repaired sufficiently for haulage before December 15, and on this account the smelters of both the Arizona Co. and the Shannon Co. were forced to close down, and did not resume operations until January 3. Their concentrators No. 1, 2, 3, and 4 at Clifton were also injured by being partly washed away, and No. 5 and 6 were idle at Morenci on account of the lack of water, which is furnished them through a six-mile pipeline from the pumping station at Clifton. The Arizona Copper Co.'s smelter was filled with six feet of debris and tailing from the big dam at the bottom of the Detroit concentrator at Morenci. A large part of the town surrounding the works of the Arizona Copper Co. was injured or destroyed by the flood. The bursting of the big dam turned loose a large head of water filled with tailing. The disaster is also attended with loss of life. The people of the injured district have hired a lawyer and entered suit against the Detroit Copper Co. for damages of $150,000.

Work on the claims of the smaller companies that occupy the outlying country has been quiet lately on account of the bad weather. However, the managements of both the Home Copper Co. and of the Gold Belt Development & Reduction Co. have given notice of an increase in their working force immediately after the breaking of the cold spell. Both the companies have promising properties. There will be a meeting on January 8 of the directors and stockholders of the Gold Belt Co., and it is expected that the present board of directors will be re-elected, and the present management endorsed.

Reliable information states that the Shannon Copper Co. will build a broad-gauge railroad from their mine at Metcalf to their smelters and concentrator at Clifton. Contrary to the method followed by the Arizona Copper

Co. in building their line along the bottom of the cañon, the Shannon people have surveyed a line following the top of the ridge and will build the ten-mile track over the mountain. While it will necessitate much time and money to put this enterprise through, the Shannon company will be gainers in the long run in that their road will not be continually at the mercy of every little shower that comes down Chase creek, and at the same time they will avoid paying the heavy haulage charges of the A. C. Co. M. L. Amster, the new president of the Shannon Co., spent a few days at Clifton last week, and stated that on his return to the East he would take steps to start the building of this road. It is hardly probable that the Shannon Co. will put up the money to build this railroad, but it will be financed by Mr. Amster and other stockholders of the Shannon company. The new road should not only save money for the Shannon company, but it should also help to open up the Metcalf district to other companies now owning claims there; it would also afford an immediate outlet for the mines of the Detroit Copper Co. in that district, which are now being actively developed, as a junction could be made with the Morenci Southern, a Phelps-Dodge property, thus saving the necessity of carrying ore to Guthrie and transferring it to narrow-gauge cars for Morenci.

The owners of the Stevens group of mines in the Metcalf district have bonded their claims to an English syndicate, which purposes to develop this promising property.——A rotary drill has been put in operation by the Hot Springs Oil Co. at their prospect well south of Safford. The casing will be pulled out and the drill started, the hole being rimmed so that a 10-in. casing can be put down. The rotary has a capacity of 1,000 ft. per month.

Salt Lake, Utah.

News From Bingham.—Labor Troubles Settled.—Garfield Smelter Satisfactory.—Fuel Shortage.—Strike in the New Haven.—Fire at Fish Springs.—Lower Mammoth Connections.—Bingham Con. to Control Grand Central.—Dividends.

A strike of much importance to the future of the Bingham-New Haven mine has been reported officially. Ore similar in character to that found in the great Highland Boy mine of the Utah Con. has been encountered in the lower adit at a distance of 870 ft. The vein has been cross-cut for 128 ft. The upper portion of the mine has been productive of considerable lead-silver ore in the past. The directors of the company are considering the building of a smelter; at present the ore is shipped to the Salt Lake valley smelters for treatment.

The hoisting plant and shaft of the Utah mine at Fish Springs was destroyed by fire recently. It is believed that the fire originated from a lighted candle left in the shaft by a careless miner. The incident happened between the change of shifts. The regular monthly dividends will be disbursed, notwithstanding the mishap.——Connections have been made with the main shaft recently let down to the 1,700-ft. level of the Lower Mammoth mine in the Tintic district, exposing commercial ore for a distance of over 125 ft. The vein has been cross-cut, showing a width of between 15 and 30 ft. Two electric hoists will be installed, and regular ore shipments will be made. A site for the smelter to be erected in the Tintic mining district by the Tintic Smelting Co. has been selected near the town of Silver City. C. W. Nibley of Salt Lake is president. There is some talk of a consolidation being effected between the Swansea and South Swansea mines.

The management of the New England Gold & Copper Co., operating at Bingham, and controlled by Massachusetts parties, has effected a settlement of labor difficulties by granting employees an advance of 25 cents per day in wages.——The foundation for the new mill of the Markham Gulch Milling Co., at Bingham, is ready; it is expected that the plant will be completed early in the spring.——It is practically a certainty that the low-grade ores of the Ohio copper mine, which is now controlled by F. Augustus Heinze and Bingham Consolidated interests, will be concentrated at a point near the Dalton & Lark mine, and plans are being laid accordingly. It is the intention to extend the Mascot adit from the Dalton & Lark mine through the mountain to the Ohio orebodies. Heinze officials are of the opinion that no other Bingham company will be able to mine and treat ores more cheaply than the Bingham Con. and Ohio companies when they will have completed the development and equipment of those mines.

The management of the Garfield smelter of the American Smelting & Refining Co. has denied the report that

Utah.

some constructional and metallurgical defects have been encountered. In fact, the manager declares that the plant has behaved entirely satisfactory; that the only reason it has not been operated at its full capacity is due to the fuel famine, which has affected all the smelting companies operating in Utah. Two reverberatories and one blast-furnace are in operation at the present time. As soon as the fuel shortage is relieved the plant will be brought up to its full capacity. By the time the new concentrating mills of the Utah Copper and Boston Con. companies are ready to turn out concentrate, the Garfield smelter will be ready to receive it. The first unit of the Utah Copper is expected to be completed in May and the Boston Con. in July.

It is reported that Bingham Consolidated interests have secured an option on the control of the Grand Central Mining Co., also in the Tintic district. With the Eagle & Blue Bell, the Bingham Con. would then have mines that could supply silicious ores for many years to come.

So far this month, seven Utah mines have declared dividends, the total aggregating $1,123,000, as follows: Utah Consolidated, $900,000; Daly-Judge, $42,500; Beck Tunnel Consolidated, $40,000; Grand Central, $15,000; Victoria, $10,000; Utah, $3,000. The Silver King Mining Co., operating at Park City, has suspended payments temporarily owing to the fact that the company's funds will be drawn upon heavily to pay for the Magnolia-St. Louis property recently purchased.

Mining Summary.

ARIZONA.

GRAHAM COUNTY.

The Calumet & Globe Co. was recently organized at Calumet, Mich., to work four claims on Lower Pinto creek. The property was purchased from D. D. Sullivan and T. S. Collins. The directors are John Bertin, James Fisher, E. A. Peterman, and T. Carlon, of Calumet; Ed. Lieblein, of Hancock, and the two vendors, both of Globe. The company is capitalized at $300,000, in $5 shares.—— Sulphide ore has been cut in the Globe Consolidated on the 460-ft. level. The vein is three feet wide, and assays 5% copper. This company will build a road from its Gem claim to the foot of Buffalo hill, to connect with the Arizona Commercial railroad.—— In the Gray mine of the Old Dominion, rich ore has recently been encountered in the cross-cut from the 760 level, which has tapped the Nevada vein. About 40 tons of ore is being mined daily from this vein and shipped to the Old Dominion smelter.—— Low-grade ore, assaying about 4% copper, has been encountered in the second tunnel of the Pinto Creek Mining Company.

PINAL COUNTY.

(Special Correspondence).—The Central Mining & Development Co. has been organized to work eight claims in the Saddle Mtn. district, with S. H. Snider as president and S. D. Gardom, superintendent. The first discovery of rich gold ore in this group was made about three months ago on the Two Queens mine. The strike gave assays running into the thousands from picked samples, and a vein was disclosed from 4 to 12 in. wide for a length of 300 ft. Later development has given equally encouraging results. The first strike was sufficiently rich to make it advisable for a watch to be placed upon the high-grade ore to guard against theft. There are four parallel veins running the length of the property, each with numerous spurs. Thirty-four prospect openings have been made, all disclosing pay-ore. The silver content runs from 14 to 190 oz. per ton, and copper from 5 to 10%. Two tunnel-sites have been located, the ore to be delivered by a gravity cable to a mill, which will be built in the near future. The richest of the ore has been sacked until the company's reduction plant is in operation.

Phœnix, Dec. 22.

(Special Correspondence).—At a meeting of the directors of the Lake Superior & Arizona Copper Co., held at Calumet recently, it was decided to build the 28 miles of railroad necessary to connect the mine at Superior with the main line of the Santa Fe, Prescott & Phœnix Railroad, at Florence, and to erect a smelter of 250 tons daily capacity. The method of financing the company has not been determined upon, but it is estimated that about $500,000 will be required by the two enterprises. The new railroad will pass through an extensive gold and copper belt. There are about 300 miners in Superior. The town is well supplied with water, and the company contemplates the erection of an electric power and lighting plant. The company owns several claims here. A good strike has been made on the claim owned by J. I. Coleman and L. U. Riggins, situated near Troy. After sinking an incline shaft to a depth of 140 ft., an adit was started to tap the vein at a good depth below the bottom of the inclined shaft. This adit is now in for a distance of 200 ft., and at the breast a 4-ft. vein is exposed. This vein lies in a contact between quartzite and schist, and stands almost perpendicular.——At the Arizona-Hercules Copper Co.'s property at the west end of this mineral belt, diamond-drill exploration work is being done. Mr. W. P. Dunham, the principal owner in the company, is at the mine to superintend operations. This work is preliminary to active development. The Arizona-Hercules is situated near the Ray and Silver King mines, in which work is to be resumed during the month, the properties having recently changed hands. The new owners propose to unwater the Silver King, utilizing the old pumping plant, which is still in good order. They expect to find good copper ore below the third level.

Phœnix, Jan. 12.

YAVAPAI COUNTY.

The Bunker Hill mine in the Big Bug district, near Prescott, is increasing its force as fast as the men can be worked to advantage. The adit is being advanced toward the large bodies of gold and silver ore, prospected by shafts ahead. The main lode of the Bunker Hill mine follows the apex of the mountain for over a mile, showing a width of from 50 to 100 ft. in places, being joined and crossed by numerous veins that will be tapped at depth by the deep adit.

YUMA COUNTY.

The Pittsburg-Harqua Hala Co. took a working bond on the San Marcos group of claims in the Salome district, and has just made a first payment of $6,000 to the owners, John Martin of Harrisburg and Dr. Ancil Martin of Phœnix. The property is situated about 12 miles from the Harqua Hala mine. The San Marcos is a gold proposition upon which considerable money has been spent in development work. The deepest shaft is down 350 ft., while two others have reached a depth of nearly 200 ft. A second deal consummated by the Martin brothers in this district was the leasing of the Harqua Hala mine to Michigan parties, who were given a 99-year lease. The mill is now completed and ready to receive ore; 20 stamps will begin dropping as soon as fuel oil can be secured, a large tonnage of ore having accumulated in the bins.

News has been received from Salome of a rich strike on the Griffin property, located in the Harcuvar Mtn., under development by the Ironwood & Arizona Development Co., composed of the same group of capitalists owning the Harqua Hala mines. The details of the strike are meagre, but it is said that a large body of copper ore was uncovered in one of the shafts, the extent of which has not yet been determined by drifts or cross-cuts. The property has been under development by the Griffin brothers for several years. The mines are situated seven miles northwest of the town of Salome, in the foothills of the Harcuvar range.

CALIFORNIA.

CALAVERAS COUNTY.

Wm. F. Jensen and W. H. Hersh, of Chicago, Walter E. Patton, of Pittsburg, Pa., and Levi Johnson, of Osage City, Kansas, spent a few days in San Francisco on their return from a visit to the Hamby mine, near Mokelumne hill. This property has been equipped and is operated by the Viking G. M. Co. of Chicago, and its president, G. E. Engstrom, has been looking after the equipment. This includes a modern 20-stamp mill and Frue concentrators, operated by electricity, a 65-ft. gallows frame, a three-compartment shaft, with a steam-hoist raising ore from the 200-ft. level and automatically dumping it directly onto the grizzly and into the mill-bin. The mill started operation the last of October and is said to have made a creditable showing for the time it has run. The present stopes are said to be in a lode 19 ft. wide, and from all reports they have a typical low-grade free-milling Mother Lode proposition. About 30 men are employed, housed, and boarded at the mine. It is understood that the gentlemen mentioned above were here to consider the advisability of taking up the remaining indebtedness on the property, greatly increasing the mill capacity and doing a lot of underground development work in the near future.

ELDORADO COUNTY.

(Special Correspondence).—The Alpine mine has cut a good body of ore in the drift on the 300-ft. level, which is thought to be a new shoot.——Clifford Cheek has some ore showing in the Golden State, which was at one time a producer.——Nels Locke has a good prospect near the old Spanish dry diggings on the Georgetown road.——Little is being done in the copper belt east of Georgetown, but it is expected that the district will show up well with development.

Placerville, Jan. 9.

(Special Correspondence).—The River Hill Co. is preparing to sink its incline shaft from the 1,300 to the 1,500 level. This is the only deep mine at work on the Mother Lode, north of the Union, and it has been producing for some years. There is a drainage adit at the 735-ft. level. A 20-stamp mill is situated near the shaft, and an air-

compressor is in operation at the mouth of the adit. George Clark is the superintendent.——The Sherman mine has reached a depth of 500 ft., and has a good showing of ore. A small stamp-mill is running, producing a concentrate worth $200 per ton, besides yielding good returns from the plates. Tom Clark is manager. Several promising prospects lie near the Sherman.——The water company ran the old Excelsior mine for some years as a quartz mine, but it is now producing gold-bearing gravel, which was cut by extending the old adit 2,000 ft. Enough gravel has been exposed to keep the 10-stamp mill running for two years. The gravel is strongly cemented. The Gray channel has yielded some samples running from 50c. to $5 per pan. At the portal of the long adit an air-blast furnishes a good supply of air to the face 3,000 ft. away, through a five-inch pipe. The Blue channel has also been cut. This channel has been worked for several miles and has produced several millions of dollars.——The Live Oak Co., operating drift mines 2½ miles above Placerville, is working eight men, and running from 50 to 60 cars per day of cemented gravel through a Ure mill, which is similar to a Krogh mill. This output has been maintained for 20 months.——Bert Carpenter has reached the gravel in the old Blue channel, on his property, about two miles above Placerville. He is working the ground through an incline shaft.——The mining industry is prosperous around Placerville. Some good copper ore has been mined near Eldorado, and a good showing of copper is reported near Fairplay.

San Jose, Jan. 12.

NEVADA COUNTY.

There are no prospects of an immediate settlement of the strike at Grass Valley. The miners still insist on a straight eight-hour schedule, and the operators demand that the men go back to work under the old schedule, pending the consideration of their demand. They promise to return an answer within 24 hours after the men return to work. The miners' union holds meetings frequently, and state that they desire a settlement, but that they believe the operators had sufficient time to respond to their demands, before the strike was called. The effect of the continued idleness of the men is that miners are leaving the camp at the rate of about 20 per day. Arizona and southern Nevada are the destinations of the majority of the men. Several of the pumpmen have been temporarily granted an eight-hour day. Even an early settlement of the strike would leave the mines short-handed, as there was a scarcity of miners before the strike and every day the supply is decreasing.—— The New York-Grass Valley mine, locally known as the Perrin mine, has undergone an entire change of management, Chester B. Allen succeeding F. H. Johnston as manager of the property. The mill will not be started until a new hoist is erected.

(Special Correspondence).—The Yuba Mining Co., operating the Yuba mine three miles east of Washington, has secured a bond on the Blue Jay about eight miles east of Washington and adjacent to the Grey Eagle.——The contour of the country in that vicinity is such that a property can be explored by adits.——At the Baltic mine, eight miles northeast of Washington, a tunnel 1,400 ft. in length is being run to open the old Crown Point shoot, out of which many thousands of dollars were taken in early days. This property joins the Star and Ethel mines.——At the Red Cross mine, near Omega, preparations are being made to install a new hoist. As soon as the hoist is in place, sinking will begin. This property is equipped with a 20-stamp mill. ——At Camptonville, 25 miles northerly from Nevada City, there is great activity in mining.——The Consolidated Willows Mining Co. at Weeds Point has installed a $3,000 compressor. They are running a tunnel to tap the Horse Valley hydraulic mine, which is considered the best in the country.——The Joubert mine at the head of Willow Creek is now running full blast.——Jahon Meek will superintend the opening of the Brandy City mine; $40,000 will be expended to get water upon the property.——At the Trent Copper mine they are making good headway with the shaft. As this is the first attempt to develop any of the copper lodes in the district, the results are awaited with much interest.

Nevada City, Jan. 15

SHASTA COUNTY.

(Special Correspondence).—Grading on the smelter site at Heroult is now completed and the erection of the transformers for the electric furnace is being hurried forward. Bricks are being prepared for the charcoal kilns, and contracts have been let for cutting cordwood. This can be obtained from the adjoining hills for the present, and as the demand increases, a supply of logs can be floated down the Pitt river. Iron ore is being hauled for the trial run, on the completion of which an adequate means of transportation will be installed. The main orebodies are about one mile from the smelter site and 800 ft. above it. The new railroad under construction from Kennett to Bully hill will pass through the smelter yard.——The Mammoth Copper Co. is actively exploiting silicious fluxing ores by the construction of a railroad to the Quartz hill district, and the examination of several properties on the west side of the Sacramento river. A railroad is also to be built to transport ore from the Mammoth mine to the smelter at Kennett in place of the aerial tramway, which has proved costly and unreliable. The length of this tramway is about three miles. The grading for the trolley road to connect the Hornet mine with the Iron Mountain railroad is completed, and track is already laid on the railroad spur. The tunnel on the Iron Mountain railroad caved last week, but traffic was resumed after a steam-shovel and grading crew had worked a few hours.

Redding, Jan. 15.

The Bonanza King Co. expects to start its 40-stamp mill at once. The plant is complete, and the electric power station in order, after the expenditure of about $150,000.—— A recent strike is reported from Harrison Gulch. Samples from the outcrop assayed well.——The Midas mine is doing but little work at present. Good ore has been struck on the 700 level, but the mill is not running.——Many claims are being located in the Shasta copper belt, the recorder having recently received 135 notices of filing in one day.

TUOLUMNE COUNTY.

(Special Correspondence).—Good reports still come from the Blackhawk mine, situated two miles west of Soulsbyville. High-grade sulphide ore containing some free gold is found there. The shaft is 200 ft. deep, and from it drifts are being run on the vein.——The Goldwin Co. last week sold its 10-stamp mill to J. B. Menardi, of Reno, Nevada. The company does not intend to abandon the mine, and work will be soon resumed at the property. Several orebodies have been opened up, and the face of the adit where the last work was done is in ore of good quality. The vein at this point is about four feet wide.——The Dondero gravel mine at Yankee Hill, near Columbia, has been bonded to San Francisco capitalists, who are represented here by A. F. Dollin and J. Sherman of that city. The company proposes to install modern machinery and carry on operations on a large scale. ——It is reported that Lyon, Baum, and McFarland have sold a one-fourth interest in the Yorktown mine, situated on the Kline ranch, near Stent, for $20,000. The Yorktown is attracting attention owing to the unusually rich strike recently made near the surface. Each day's work has helped to verify the belief that this mine has a promising future. ——Thirty stamps are pounding on ore at the Harvard and ten more will soon be let down. Sixty men are employed. ——Twenty tons of ore from the Cosmopolite mine were milled recently, and the result is said to have been good.

Tuolumne, Jan. 8.

(Special Correspondence). — Los Angeles people have bonded the Garfield mine and will erect a 10-stamp mill on the property. A rich strike was recently made in the Garfield, and some high-grade ore is ready for milling.——The Mountain Mining Co., which is operating the Mary mine, situated north of Tuolumne, will begin work at the Prudhomme, in the same vicinity, shortly. Development work has been going on at the Mary mine for months, and it is one of the most promising of the new mining properties on the East Belt. W. A. Monroe is superintendent.—— The United Mines Co., which owns the Grizzly, Lady Washington, New Albany, and Dead Horse mines, is increasing its crew for development work. The machinery for the 100-stamp mill has nearly all been delivered, but owing to the unfavorable weather the erection of the mill has been

delayed. The ditch and flume, several miles long, have been completed.—— A new shaft is being sunk at the Parallel mine, situated near Soulsbyville, the old one having caved in since the mine was abandoned many years ago. The new shaft shows a vein of good ore 12 in. wide.—— At the Patterson, the winze in the south drift has been cleaned out and enlarged to a depth of 30 ft., and the work is still in progress. It is the intention to run a raise to the surface and sink to a depth of 400 ft., making a three-compartment shaft. The pipe-line will soon be completed and the hoist will be operated by water-power.

Tuolumne, Jan. 14.

COLORADO.

DOLORES COUNTY.

Rico's shipments for 1906 were about 6,000 tons, much of which was concentrate, with an average value of $135 per ton. The United Rico Co. led the production with 112 cars, the Wellington following with 81 cars, the Pro Patria 16, Swansea 10, Swickhimer two, Silver Swan two, and Gold Anchor, Bancroft, and McGill & O'Keefe each one car, totaling 227 cars.——The United Rico Co. elected D. H. Moffat chairman of the board of directors for the ensuing year, and A. B. Roeder general manager. The general offices of the company have been moved from Denver to Rico.

SAN JUAN COUNTY.

Work is being pushed during the winter months with gratifying results at the Bullion King mine, at the head of Porphyry gulch, immediately west of the Silver Ledge. The group embraces 17 claims and a millsite, seven of the claims being patented. The principal veins so far opened up are known as the Lake View, Oliver Twist, Bullion King, and Francis P., and the present workings are so directed as to tend toward the ultimate development of these main veins by one system of operation. These veins are strong and can be traced on the surface for miles, extending over the ridge and well down into San Miguel county. They vary from 10 to 50 ft. in width. The quartz is impregnated with copper and lead sulphides, carrying both gold and silver, and giving an average return of $10 per ton, and concentrating at the ratio of 5 to 7 into one. Arrangements have just been completed with the Animas Power & Water Co. to furnish power for the electric drills that are in use at the mine. The present force will be increased as soon as this connection can be made, and a mill built to handle the product of the mine. H. N. Timolat is manager, with A. J. Aurand as superintendent.——In Prospect basin, just over the crest of the divide, are situated the properties of the Iron Hat Copper-Gold Co. Development has shown up large and well-defined veins, the ore being mainly copper, carrying gold and silver. The breast of the adit is now nearing 350 ft. and several carloads have been shipped. On the opposite slope of Red Mountain, the Guston, Yankee Girl, Robinson, and Congress are situated—mines which have produced over $12,000,000 in the past. Arrangements have been perfected for keeping the roads open and free of snow all winter, so that work will be prosecuted on these properties with vigor, irrespective of weather.

IDAHO.

BLAINE COUNTY.

The Idaho Consolidated Co. has started work again on its property near Hailey. The shaft is down 70 ft., and electric drills are ordered, with which the shaft is to be sunk to the 1,000-ft. level. This company has purchased the Minnie Moore mine, and now has about 20 claims. I. E. Rockwell is the general manager, Sam Allen is the superintendent, and J. J. Donovan the chief engineer.——There has been a revival of mining in the Wood river district during the past year, especially at Galena camp and the Little Smoky region.

NEZ PERCE COUNTY.

(Special Correspondence).—The American Placer Mining Co., the stock in which is owned principally by J. M. Porter, of Spokane, has between 200 and 300 acres of workable placer ground seven miles from Pierce City, on which operations will be resumed next March. Last season the property was put in good condition for operation. A hydraulic elevator of the Ruble pattern was installed, and for the short time it was used it proved satisfactory. The Ruble elevator combines the grizzly, elevator, and undercurrent. A No. 2 giant, with 4-in. nozzle, drives the gravel to the elevator, and a second giant of the same size drives it through. While being elevated the finer sand and gravel, which carries the gold, is screened from the boulders, the valuable portion passing to an apartment having a tight, smooth, inclined floor, down which it is washed to the sluice-boxes and riffles. By actual test, 26 yards per hour were handled. Boulders 32 by 18 by 16 in. were elevated 22 ft. with a 4-in. nozzle, under a head of a little over 100 ft. Mr. Porter states that any boulders the field giant can drive to the elevator can be put through. This elevator is on rollers and can be readily moved.

Spokane, Jan. 10.

OWYHEE COUNTY.

Work on the north drift on No. 2 level of the Potosi mine at Silver City has been suspended, as the north drift on the Knickerbocker vein on the same level runs parallel to it and will explore the same ground. The south drift on No. 2 level is going ahead without any notable change in the character of the vein. Notice of shipment of power-drills and compressor has been received from Denver.——At the Banner a raise is being run from the cross-cut tunnel to the upper drift on the Webster vein. The vein has widened out, from a stringer in the tunnel to three feet in the raise. The completion of this will aid the ventilation and make it possible to start work on the cross-cut tunnel, which is now in 1,100 ft., and near the Banner ledge.

NEVADA.

ESMERALDA COUNTY.

The Goldfield strike has been settled, the miners having voted to accept the proposition made to them by the mine owners. The total vote cast by the miners' union was 1,847, and the number in favor of ending the strike was 1,293, 554 voting to reject the proposals of the committee. The proposition accepted is a $5 day for miners and skilled help, and $4.50 for laborers. A lively session on the Stock Exchange followed the announcement of the result of the balloting, and there is great rejoicing in the district.

LINCOLN COUNTY.

(Special Correspondence).—J. M. Albright has recently returned from the new copper strike 25 miles up the Colorado river from the mouth of El Dorado Cañon. Assays across five feet of the surface of the ledge gave an average value of 16% copper and $5 in gold. He secured these locations through an Indian guide. The only way to reach that section is by boat up the Colorado river from the mouth of El Dorado Cañon. After leaving the river everything must be taken in on packs, and the country is exceptionally rough. In spite of this the district is already filling with prospectors and when the weather moderates a camp will be established on the river and some regular means of communication installed between the new copper district and El Dorado Cañon.——Operators on the flat about four miles west of Searchlight have struck some rich ore in the shaft; samples assayed in Searchlight gave returns of $216 per ton.——An ore-shoot has been uncovered in the 200-ft. level of the Wyoming Searchlight Co.'s property, three miles west of the town. Mr. Carlston is manager of the mine. The apex of a good ore-shoot has been cut. The main shaft of the property is down 300 ft., and, as soon as a station is cut, a drift will be driven under the new strike.——G. W. Lloyd purchased during the past week the Esther group and also the Golden Calf in the northern part of the district. These properties adjoin the Florence group to the west, and have a good surface showing.——Fourth of July Mountain, four miles east of Searchlight, has the latest strike. In a tunnel on the Stanley Forbes a vein was cut which has a streak of ore about a foot wide that shows free gold.——The Searchlight Consolidated Co. is actively at work. The house for the superintendent has been completed and a 25-h.p. hoist ordered. The new shaft is down 40 ft. and the timbering nearly completed. As soon as the necessary accommodations can be arranged for the men, the company will put on another shift and sink the shaft to the water-level. The control of

this property has recently been sold to Philadelphia capitalists.——A contract has been let to sink 100 ft. on the Zodiac group west of the Quartette. This property has been acquired by A. M. Squires, of Los Angeles.——Development work is going on around the Wyoming Searchlight Co. A lot of surface prospecting is being done on the Big Eight group. The Golden Rod, which adjoins it on the north, has just completed a 50-ft. shaft, and a contract has been let to continue the same to the water-level.

Searchlight, Jan. 11.

NEW MEXICO.

SANTA FE COUNTY.

(Special Correspondence.)—Richard S. McCaffery, general manager for Lewisohn Bros., New York, owners of the Santa Fe Gold & Copper Co., expects to blow in the 200-ton smelter at Santa Fe, within a few days. This plant, which has been idle for some time, has been put in shape for treating ore from the mines of this company.

San Pedro, Jan 11.

OREGON.

BAKER COUNTY.

(Special Correspondence).—The plant of the Oregon Smelting & Refining Co., of Sumpter, operates only periodically, as it has a capacity of 150 tons per day, and the district does not supply a sufficient tonnage to keep the plant in continuous operation. R. B. Green is superintendent. The smelter has a 38 by 144-in. matting furnace that turns out a matte usually carrying 10 oz. gold and 60 oz. silver per ton, and 15 to 40% copper. It handles the high-grade ore and concentrate of the district, the bulk of which are dry ores, making it necessary to ship from Idaho the copper ore required in producing the matte. The ores from Cable Cove, however, are iron sulphides, and the mines at Quartzburg, including the Standard, Copperopolis, and Dixie Meadows, will in the future be able to supply a good tonnage of copper-iron sulphides. The steady shippers of the district comprise the North Pole and Columbia, both situated near Bourne. The Mountain View, Eureka & Excelsior, Bonanza, Elkhorn, California, Imperial, Buckeye, and others have made frequent shipments.

The E. & E., belonging to Johnathan Bourne, of Portland, is doing development work and making tests and experiments to solve its milling problem. The main shaft is 700 ft. deep, with drifts 500 ft. north and south from the shaft on the 700-ft. level. On the 500 level drifts have been run 1,500 ft. on the vein in opposite directions from the shaft. A similar amount of work is shown on the 400-ft. level. It is stated that the best ore found in the mine has recently been cut on the 700-ft. level. F. W. Bradley, of San Francisco, is consulting engineer for this property, with E. P. Kennedy in direct charge.

The Imperial, at Cable Cove, in charge of R. H. Benedict and B. O. Kempfer, is developed by 4,000 ft. of adits and cross-cuts. Its mill is equipped with jaw crushers, Huntington mills, and tables of the Wilfley, Overstrom, and Standard make. One or two sets of rolls will be added next spring.

The Buckeye is situated on Little Cracker creek, in the vicinity of Bourne, and is owned principally by Jas. B. Slpe, of Pittsburg, and T. S. Kennerly, of Sumpter, the latter being the manager. The development is in the nature of adits on the vein. The main vein is on a contact of quartzite and slate, the width being about 50 ft. between walls. Another vein, parallel to the principal vein, is within a porphyry dike that cuts through the slate. The ores comprise copper-iron sulphides, bearing gold and silver, much of the gold being free. Good buildings have been erected and development is in progress.

Recent heavy snows in the Blue Mtn. serve to improve the haulage, as sleds are now in general use, and on such roads as can be kept open the sleighing will be good for the next two or three months, and this will be the most favorable time for hauling ore and concentrate.

The Sovereign Consolidated Copper Co. was incorporated last month to develop a copper lode in the vicinity of Sparta, 35 miles northeast of Baker City. The directors of the new company comprise James A. Howard, John Arthur, K. O. McEwen, W. J. Patterson, and John Rand, all of Baker City. The first three named operated several years ago in the Sumpter district. The lode is silicious, and cuts through a greenstone country. On the surface is a cap of gossan, from which the copper has been partially leached out, a re-deposition of the copper appearing at greater depth. Pits and shafts on the property show copper ore running from 2 to 10% for the depth of 40 ft. Cross-cuts to the lode from a lower point furnish evidence that the sulphides begin at 100 ft. down. The lode varies in width from 100 to 220 ft. The property is to be developed vigorously this year, and those in control believe that by doing so they will soon be in position to supply an ore that will smelt profitably itself and mix advantageously with the silicious ores of the Sumpter district.

Within the last few days $10,000 in free gold was taken from the Emmett vein of the Virtue Mines Development Co., near Baker City. This amount of money was taken from less than a ton of quartz, which came from a depth of 25 feet.

Sumpter, Jan. 3.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Anticipating the walk-out of the miners and millmen who voted to remain away from work if the eight-hour day was not granted, the seven companies affected by the demand have closed their properties. Both sides are determined in their stand, and no negotiations are under way. The properties concerned are: The Golden Reward, Mogul, Imperial, Reliance, Wasp No. 2, the Lundberg, Dorr & Wilson, the Portland, and Clinton. It requires about two days to clean up all the ore in the mills, before shutting down, and the operators met a committee from the union and asked to be allowed to retain a sufficient force of men for this purpose for two days longer, but the union refused to grant the request. Before closing down all the horses used underground were hoisted out, and 60 head have gone to the country for pasturage. The fires under the boilers have been drawn, and all pumping has ceased, as the demands of the union included pumpmen, topmen and engineers. At the Golden Reward, where the water has proved a costly item, the pumps were pulled out, and all shafts will be allowed to fill up.

BRITISH COLUMBIA.

(Special Correspondence).—The Inland Empire M. & M. Co. has been incorporated by Alfred Bachtold and associates, of Walla Walla, Washington, to develop and operate a property 10 miles from Nelson. Sufficient work has been done to show a good body of iron sulphide ore, which runs well in gold and silver. Plans are being made for a concentrating plant.

Spokane, Jan. 12.

The Consolidated M. & S. Co. has purchased the Enterprise claim. This company now owns 4,500 ft. along the Centre Star-Le Roi lode, which runs through the Enterprise, Idaho, and Centre Star claims. The Consolidated Co. received 2,115 tons last week at the Trail smelter.——The lessees of the Cariboo property at Camp McKinley are unwatering the mine. Three pumps are at work and the water is below the 200-ft. level.——The ore shipments for the week ending Jan. 5 were: Boundary, 3,562 tons; Rossland, 2,692; and Slocan-Kootenay, 1,486 tons. Smelter receipts: Granby, 1,908 tons; B. C. Copper, 6,900; Dominion Co., 2,558; Trail, 3,115; Nelson, 245, and Marysville, 600 tons.——The mines of Prince of Wales Island are shipping steadily to the Coast smelters. Mt. Andrews, owned by the Britannia Syndicate; Karta Bay, under lease to the Alaska Copper Co.; and the Jumbo mine of the Alaska Industrial Co., are all shipping ore.——The principal productive mines in the Kootenay camps are: The Silver Cup and the Sunshine mines from the Lardeau district (Trout Lake and Ferguson camps); the Paradise, Nettie M., and Athalmar mines in northeast Kootenay; and the Arlington and Ymir mines, near Slocan City.——The St. Eugene in East Kootenay is a large producer of silver-lead ores. This property is now owned by the Consolidated M. & S. Co. of Canada. At this mine 84,066 tons of ore were milled during the first half of last year, producing 14,000 tons of concentrate, which was shipped to the smelter, with 1,489 tons of crude ore.

Personal.

R. G. HANFORD has gone to New York.

LIONEL LINDSAY has gone to El Oro, Mexico.

F. L. BOSQUI is at the University Club, Denver.

W. M. BREWER has returned to Victoria, British Columbia.

EUGENE A. H. TAYS is visiting San Francisco from Mexico.

ARTHUR L. PEARSE is on his way from Salt Lake City to London.

JOHN A. REID has been on a visit to San Francisco from Stockton.

T. J. JONES, of the Mountain Copper Co., is on a vacation in the East.

C. W. PURINGTON is at Boston; he will proceed to London shortly.

E. A. WALL has returned to Salt Lake City from a short visit to Chicago.

ERNEST H. SIMONDS now has his office at Room 230, 787 Market St., San Francisco.

BEN S. REVETT is spending a few days at Breckenridge, before proceeding to New York.

N. W. HARPER has been appointed manager of the Golden Pole mine, in Western Australia.

W. J. LORING, who now resides at Melbourne, is visiting Western Australia, on a tour of inspection.

R. H. BURROWS has returned to Guanajuato from six months' professional work in Sinaloa, Mexico.

W. H. KNOWLES has returned to Denver from the investigation of mining property at Goldfield, Nevada.

G. E. KING, formerly superintendent of the St. Eugene mine and mill at Moyie, B. C., is now at Spokane.

J. L. PARKER, lately manager for the Brown-Alaska Co., has opened an office as consulting engineer at Seattle.

GODFREY DOVETON, of Denver, is at the Esperanza mine, El Oro, Mexico. He will return to Denver early in March.

WM. M. STEPHENSON has been appointed smelter superintendent for the Weimer Copper Co. of Idaho, with headquarters at Salt Lake City.

JESSE SCOBEY has resigned as manager for the Pride of the West Co., on the sale of the property to George Westinghouse. He is now inspecting mines in Jalisco, Mexico.

ROBERT PEELE has withdrawn from the firm of Olcott, Corning & Peele, on account of increasing work at Columbia University. The business of the firm will be continued under the name of OLCOTT & CORNING.

HOWARD P. SAUNDERS has opened an office at 319 Dooly Block, Salt Lake City, where he will conduct a general consulting and engineering business. He has been appointed consulting engineer for the Tintic Smelting Co., and for two other smelting companies.

NORMAN CARMICHAEL, superintendent of the Arizona Copper Co.'s mines at Morenci, has been appointed assistant general manager for the Company and second vice-president of the Arizona & New Mexico Railroad, with headquarters at Clifton, Arizona.

Obituary.

One of the best known and most loved men in the engineering field passed away Tuesday, January 1, in the sudden death at St. Mary's hospital in San Francisco, of VINCENT H. MARTYN, after a week's illness with pneumonia. Mr. Martyn was but 32 years of age, but had won a high place in the estimation of engineering men and others in allied interests. He was Western advertising representative of *The Engineering & Mining Journal* and brought to the duties of his position an aggressiveness and faithfullness that won him admiration, and a genial nature and a jovial disposition that gave him hosts of friends. To those with whom he thus came into contact the news of his demise will be a sorrowful shock. Interment was at Oakwoods, Chicago, on January 9.

Books Received.

ENGLISH WEIGHTS AND THEIR EQUIVALENT IN KILOGRAMMES is a little pocket-book of 90 pages, compiled for the use of merchants and shipping agents. It was prepared by F. W. A. Logan, and is for sale by the MINING AND SCIENTIFIC PRESS for 50 cents. Pounds avoirdupois, the British complicated subdivisions, and kilos are given side by side. To those who are operating in Mexico this little brochure ought to be of service.

GOLD MINING MACHINERY by W. H. Tinney. This is a practical handbook for the use of mine managers and engineers, it deals with the selection, arrangement, and installation of machinery. The book contains 300 octavo pages, well illustrated. It is written by a mining engineer, who formerly was in charge of mines in India and West Africa. It is a useful volume. Published by D. Van Nostrand Co. and for sale by the MINING AND SCIENTIFIC PRESS at $5.

THE ENGINEERS SKETCH-BOOK by Thos. W. Barber is published by Spon & Chamberlain. It is a book of 355 pages and gives 2,987 sketches illustrating details of mechanical movements, devices, appliances, and contrivances employed in the design and construction of machinery for every purpose. The aim is to provide side by side suggestive sketches of the various methods in use for accomplishing any particular mechanical movement or work, in a form easily referred to, and devoid of needless detail and elaboration. A sketch, properly executed, is—to a practical man—worth a folio of description; and it is to such that these pages are addressed. For sale by the MINING AND SCIENTIFIC PRESS for $4.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, January 17.

Argonaut	$4.80	Furnace Creek	$5.50
Con. Virginia	1.05	Savage	0.92
Mexican	1.02	Sierra Nevada	0.68
Ophir	2.95	Yellow Jacket	1.10
Belmont	5.37	Montana	3.95
Jim Butler	1.30	Mohawk	17.50
Jumbo	4.12	Red Top	4.35
Jumping Jack	0.35	Sandstorm	0.75
Manhattan Con	0.96	Silver Pick	1.54
Midway	2.20	Tonopah Ex	5.75

METAL PRICES.
By wire from New York.

	Average prices for week ending January 10.	Average prices for week ending January 17.
Copper—Lake (cents per lb)	23⅞ @24.79	24½ @25
" Electrolytic "	23⅞ @24.17	24⅛ @24½
" Casting "	23½ @24	24¼
Lead "	6	6
Spelter "	6.70@6.75	6.70 @ 6.75
Silver (cents per oz.)	69½	68¼

ANGLO-AMERICAN SHARES.
Cabled from London.

	January 10. £ s. d.	January 17. £ s. d.
Camp Bird	1 8 6	1 7 6
El Oro	1 6 3	1 7 6
Esperanza	2 16 3	2 16 3
Dolores	1 5 6	1 8 9
Oroville Dredging	1 0 6	1 0 6 ex div
Stratton's Independence	0 3 6	0 3 9
Tomboy	2 3 9	2 2 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Jan. 10.	Jan. 17.
Bingham Central	2	2
Boston Copper	31½	31⅞
Calumet & Arizona	179	180
Cumberland Ely	13	13⅛
Dolores	7¾	7¾
El Rayo	7	7
Guanajuato Con	5⅛	5
Giroux Con	10¼	10
Greene Con	31¼	30⅝
Nevada Con	19¼	19¼
Nipissing	14	14⅛
Tennessee Copper	55	50¾
Tonopah Ex	5¾	5⅝
Tonopah-Belmont	5¾	5¾
Tonopah	19	19⅞
United Copper	74⅜	72¾
Utah Copper	37½	40½

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BAROMETRIC readings rise or fall approximately one inch for each 900 ft. of depression or elevation.

Cobalt was formerly used almost solely to color glass, enamel, and porcelain, as it produces the purest of the fast blues. Lately it has been ascertained that it is valuable in the manufacture of storage batteries.

IN most cases fusion is attended by an increase in volume; to which there is the prominent exception of ice; also bismuth, antimony, brass, iron. Metals like these are best for casting, as they give sharp impressions. For this reason bismuth and antimony are used in type metal.

AT very high voltages there is an important leakage of energy between the conductors of a circuit, and this loss varies inversely with the distance between these conductors. Thus it happens that inductance makes it desirable to bring the parallel wires of a circuit close together, while the leakage of energy from wire to wire makes it desirable to carry them further apart.

MANY alloys soften gradually, the most fusible constituent melting first. Others have a fairly definite melting point, usually lower than that of their constituents. For example, Wood's fusible metal, four parts bismuth, two lead, one cadmium, one tin, melts at 60°C. Steel and cast iron, containing carbon, melt at a much lower temperature than cast iron. Alloys are considered to be solutions of solids in solids.

THE smelterman often receives his ores, which are valuable products, and stores them carelessly or at least inconveniently, for handling and charging to the furnace; while, at the same time, he takes great pains as to the disposal of the slag (a waste product) as cheaply and conveniently as possible. Why be so careful in the latter case with that which is worthless, while the valuable material runs the risk of loss?

A CONVENIENT FORMULA for the calculation of true meridian is the following:

$$\text{Cos A} = \frac{\text{Sin d}}{\text{Cos L} \,.\, \text{cos h}} - \text{tan L} \,.\, \text{tan h}.$$

where A = Azimuth of sun from south, L = latitude, h = altitude — refraction, and d = declination (+). This is far simpler than the cumbersome formulæ usually found in many of the standard surveying textbooks, and is now being used a good deal.

In regard to the enquiry concerning screens: A rotary screen (trommel) or 'impact' screen will separate coarse and fine sands. Try a cone separator (hydraulic classifier). This can be adjusted to produce almost any reasonable result that may be desired. The quotation concerning extraction is not clear. It may refer to the treatment of Homestake ore, where 50 to 60% is saved by amalgamation. The settling cones are employed to effect a partial (only) separation of sand and slime, which are treated later in separate plants.

AN effective method of agitating pulp containing 40 to 70% sulphides is by means of a horizontally disposed 'propeller' or screen. This is secured to a vertical shaft running in bearings and driven at the upper end by belt or gears. The pulp must not be allowed to become so deep as to submerge the 'propeller,' or it may cake and hold the latter so firmly as to make excavation with shovel necessary. In the event of stoppage, for either a short or long time, the pulp settles, but it may quickly be stirred up by revolving the screen; this creates such a strong downward current, that the material is quickly taken up and held in suspension in the rapidly whirling solution of cyanide or whatever the liquid may be.

WHEN ore contains a large percentage of sulphides, and the gold is saved by amalgamation, it is necessary that the outside plates be given a heavier grade than when treating free-milling ore. It is useless to quote an arbitrary grade, but 2.5 in. per ft. would probably be about right. The plates should be so arranged as to change the grade to suit varying conditions. A larger amount of water will be required than with ore containing a relatively small percentage of sulphides. The fineness of crushing, character of sulphides, and their kind also, are important factors, due to difference of specific gravity and the cleavage of the several kinds of sulphides. A shaking plate will usually give better results than a stationary one, on heavy sulphide ore.

IT IS quite possible to splice rubber belts successfully. The mode of procedure is to strip each ply of each end of the belt about 18 in., then one ply of one end is laid on the corresponding ply of the other end and cement is applied, which is allowed to soak into the belt for three or four hours. The same treatment is given the next plies and then the belt is vulcanized in the press. If the belt is to be the same length as formerly, a new piece of belt must be spliced in. Rivets are not necessary. To secure a good piece of work, the belt should be sent to some manufacturer of rubber belting, of which there are two or three in San Francisco. If the belt is an old one it would be better to lace it, unless it is being used on a dynamo or other machine running at a very high speed.

THE USE OF OIL IN THE BLAST-FURNACE.—T. Holloway has used oil in a small experimental furnace and also in a 10-ton furnace where refractory zinc-lead ores are treated, for a period of upward of five years. The oil was used to assist the smelting in a temporary way, and to remove crusts or accretions by smelting them out. His arrangement consists in fitting a small pipe with a regulating valve from an overhead oil-tank to the entrance of each tuyere opening, so that the oil, as it drops across the tuyere, is caught and atomized by the blast (10 oz. or more), volatilized by the heat of the furnace, and burnt as gas. The oil was only used as necessary in regulated flow to heat up the furnace at the tuyere region and to smelt out crusts which might have formed. It gave extra heat at a moment's notice to the smelting zone and the cost and amount used was small.

THE pollution of air in mines is sometimes due partly to the emanation of gases from the surrounding rocks, but principally from the following artificial causes: (1) Respiration of persons and animals, (2) combustion of the candles and lamps, (3) absorption of the oxygen by pyrites and other minerals, (4) putrefaction of timber, (5) explosion of powder, (6) dust from boring, etc. Of these the decay of timber underground is one of the most important, and it should be urged that the practice of leaving the useless decaying timber to infect the new pieces put in, sometimes making a level a hotbed of putrescent matter, is both offensive to the senses, and injurious to the men. One of the recommendations of the Ventilation of Mines Board in Victoria (Australia) was that all the bark should be removed from the timber before it was sent underground.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Black Sand.

The Editor:

Sir—I have noted with much interest Mr. Maxwell's letter in your issue of November 10, referring to this subject, and having personal as well as business interests at stake, I am equally as anxious as Mr. Maxwell to obtain ideas and solve the problem.

Unfortunately for the interest of abstract science, many other workers, like myself, are no doubt engineers employed by large firms, who cannot, in justice to themselves or their employees, reveal all the knowledge that they acquire. There are, however, a number of points of general interest open to discussion by all parties, and I take pleasure in calling Mr. Maxwell's attention to some of them, and trust that this may also be the means of raising a general discussion in the columns of your journal.

There is no new discovery about 'black sands.' They are to be found disseminated throughout the sand and gravel—both ancient and modern—of practically all river, lake, and sea-beach deposits. The sand consists of numerous particles of different minerals having a high specific gravity, and of such a nature that they cannot be readily decomposed by the action of weather or water. The various minerals are merely associated together by virtue of the fact that they are all of high specific gravity, and also, that owing to their durable structure, Nature has had the opportunity of concentrating them in the river channels from a vast area of country from which they were originally eroded, and the nature of the minerals composing the grains will therefore largely depend upon the geological features of this area. The grains are of all sizes, from a maximum of about ¼ in. diam. down to material that will pass through a 200-mesh screen or even finer.

The whole question is simply one of ordinary placer mining, with some definite system worked out for saving a larger percentage of fine gold and also of saving all of the other by-products that have hitherto been allowed to run to waste, and of doing this on a strictly commercial basis, without undue capital expenditure and at such low cost of operation that a sufficient profit will result to repay capital, interest, and a good surplus besides, before the deposit is exhausted.

Wild statements have been made regarding the value of black sands, and samples have been submitted which assayed $1,000 per ton, but it must be remembered that these samples consisted of a few pounds *actual weight* containing a few dollars *actual value*, that had been concentrated down from possibly many hundred cubic yards of gravel, and that before one ton could be obtained, probably 4,000 to 5,000 tons of gravel had to be washed down, so that the real value of the original deposit in place possibly did not exceed 20 cents per ton. The first thing to be done, therefore, is to base all reports on the value per original ton or cubic yard of gravel in place, from which the black sand concentrate has been obtained.

When dealing with the mining of an alluvial deposit for the extraction of black sand and its and associated minerals as a commercial proposition, I would suggest the following line of procedure:

First, a survey should be made to show the topography of the surrounding country, and of the surface area; the length, breadth, and depth of the deposit, especially with relation to the drainage. Data should be collected regarding the maximum, minimum, and average flow of all streams and rivers in the neighborhood. In river deposits, the possible flood line is of great importance. Possible hydro-electric power sites in the neighborhood should also be noted, as there are many modern methods applicable, that were not within reach of the early placer miners, where electric power can be obtained conveniently for pumping, elevating, and conveying, and for driving the necessary machinery for any plant that may be installed.

Second, the ground should be thoroughly tested either by drilling or by shafts; if the seepage is not excessive, the latter is preferable. In case of an elevator proposition, the proportion of fine to coarse gravel must be carefully noted as follows:

The proportion by volume per cubic yard of all gravel below two inches, from 2 to 5 in. and from 5 to 12 in. Gravel over 12 in. must be considered as too large either for practical dredging or for hydraulic elevating.

If conditions permit, the whole of the gravel extracted from the shafts should be washed, and the coarse gravel stacked on one side. This may be conveniently done by means of a washing platform discharging by a short sluice into two or more pairs of rockers, which may alternately be cleaned up at short intervals. No riffles should be put in the sluice, nor quicksilver used. The clean-up of the rocker riffles must be passed through a 10-mesh screen, the undersize going directly to a settling vat for further test treatment and the oversize being roughly picked over and thrown to waste. Any coarse nuggets or gold that may be caught on the rocker grizzlies or on the washing platform, should be kept separate and their individual weights and measurements recorded.

That which is saved in the riffles of the rocker may be considered as material that could be saved by ordinary sluice-box methods and that could certainly be saved by sizing and concentrating on the tables. The tailing from the rockers must also be weighed and passed through a 10-mesh screen. The oversize should be roughly picked over and then thrown to waste, and the undersize 'panned down' by panning back and forth between two miner's pans. If skill and care are exercised, practically all of the black sand that has escaped the rockers can be saved by this method. All of the concentrate caught by this means, will have to be tested as mentioned below.

The gravels of different mines vary so greatly, as do also the proportion of the different associated minerals and the size of the grains, that it is more than probable that each particular plant will have to be designed with regard to the local conditions. I think, however, it will be generally conceded, that all gold and platinum grains above ¼ in. diam. are comparatively easy to save. The real question is how to save the fine, and especially how to separate as well as save the associated by-products, without destroying one to save the other. The following additional tests are therefore necessary, and will aid in throwing some light on a possible solution of this problem.

The material saved from the settling vat of the rockers, and from the pan concentrate, should be carefully dried in sheet-iron trays over a roughly constructed furnace. For small tests, the miner's gold pan may be used for this purpose. Care should be taken to make certain that the settling vats are thoroughly clean and also that the trays are carefully dusted after the product has been dried, as otherwise some of the fine gold is liable to be lost. The dried product should now be weighed in bulk and a record made of its actual weight in pounds and of its proportionate weight per cubic yard of gravel from which the concentrate was extracted. For small hand tests, it is most convenient to give the weight in grams and for the large tests in pounds, though if the facilities exist, it is far best to use the metric system right through. Unfortunately most miners do not understand the metric sys-

tem, and a report to be intelligible to them, must be given in cents per cubic yard, and the weights in pounds.

The dry product should now be passed through a series of ordinary laboratory sieves from 10 down to 100 mesh or even finer. Each oversize will be carefully separated and weighed in bulk, the magnetizable product will be removed and weighed and the residue can then be conveniently treated by the old-time method of blowing, care being taken to blow the tailing on a large sheet of paper, so that it can be collected for further treatment. The gold particles remaining in the small blower must then be weighed on a button balance and placed in a small vial properly labeled for future reference. An assay sample should be taken from the original pan concentrate and also from the magnetizable product and the residue after the gold grains have been removed, and assays made and recorded. This process may be carried on for the oversize of all the different screens and the final undersize, which passes the finest screen used. The results of these tests may then be tabulated.

As the result of these tests, it will now be possible to form some idea as to where the values exist, that is, so far as the gold is concerned, but it will be found to be exceedingly difficult to remove the gold from the platinum, except by resorting to the usual refinery methods. The residue remaining after removing the magnetizable product, will consist of other by-products, some of which may have a commercial value, together with a certain amount of fine gold, and just here is where the great field for research is open; for at the present moment, I do not know any process by which these different products may be separated and put into marketable form.

Care must also be exercised in making a magnetic separation of the magnetizable particles, for if too strong a magnet is used and swept hurriedly through a large mass of sand, the clusters of iron grains will almost always pick up and hold in suspension a certain number of gold particles. For laboratory purposes, I have found it most convenient to use an ordinary 5 or 6-in. horseshoe magnet and to cover the poles with a fine cambric bag. I then spread out the sand to the thickness of 1/16 in. on a piece of paper; and gently pass the covered magnet back and forth over the surface, and the magnetizable grains will cluster on the outside of the bag. The covered magnet with its adhering particles is then placed in a glass bowl and the magnet withdrawn from the bag and the latter shaken. This operation should be repeated until all the magnetizable product has been separated from the sample. The product collected should again be spread out on a piece of cardboard and gone over a second time with the magnet; this time, however, the bag must be drawn tightly over the poles of the magnet, and the latter must be tapped gently while picking up the grains, so that any non-magnetizable gold or platinum particle will be freed from the clusters and fall back on the cardboard by virtue of its specific gravity. The use of a bag as described above will be found to facilitate the operation, and is much quicker than placing the bare poles of the magnet against the black sand.

The gold that has been separated should be carefully examined under a glass, and notes made regarding its surface appearance. It will also be a good plan to make an amalgamation test and find out by weighing what proportion of the gold will or will not readily amalgamate.

As a result of these tests, we now have the following data:

1.—The weight of fine products resulting per cubic yard of gravel that will have to be treated by concentration, and we can now therefore estimate upon the necessary talbe area per cubic yard of gravel to be washed.

2.—The weight of black sand concentrated per cu. yd. and the approximate gross value per ton of concentrate, and also per cubic yard of gravel.

3.—The proportion by weight of separation that can be made by magnetic methods.

4.—The values, if any, that are in direct association with the iron grains and would be lost by this method. Gold and platinum assays should be made.

5.—The values that remain in the non-magnetic residue subsequent to wind separation of the clean gold, and that with our present knowledge can only be saved by smelting.

6.—The value of the clean gold that has been caught by the three processes.

7.—The proportion of gold that will amalgamate, and if the non-amalgamating gold is coarse or fine.

7.—The quantity of residue containing the by-products that need further treatment.

In the foregoing, I have merely outlined some of the most important tests, though numerous others will no doubt be made before a final solution of the problem can be arrived at. We may, however, now commence to formulate some definite arrangement for a plant to treat the black sand and to indicate the nature of the problems most likely to be encountered. Broadly speaking, all of the coarse material of a placer is valueless and therefore the sooner it is dumped and gotten rid of, the better. All coarse gold above ¼-in. size is easy to catch, and an arrangement of a few riffles in a short line of sluices will take care of that feature. Hence the first and most important step is to size the material say to ¼ in. and reject the coarse after passing through a sluice. It will be equally necessary to get rid of the excessive quantity of clay and fine product, which might impede the successful operation of further concentration.

As dump is an important consideration in many placer mines, it will be necessary to design a plant with as little loss of head room as possible, and I would suggest the following arrangement: At the discharge end of a sluice, where the material is received from mining operations, a grizzly should be placed, having a sufficient area to pass all of the fine material and practically all of the water. It should be placed at such an angle that the coarse material will roll off to dump. The grizzly should be provided with taper bars and spaced about 7/16 in. All of the fine material will pass by a large sluice to a distributing and hydraulic classifier, which will get rid of the excess water and very light sand and clay held in suspension.

As a certain amount of float gold might be carried away to the reject, I would suggest that this be passed through some form of amalgamating device, the Pierce amalgamator being a good machine for this purpose, and as the light gold has probably a clean surface, it will be fairly easy to amalgamate. It will, however, be advisable to make a number of tests by means of settling vats, to find out whether the value of the gold and by-products saved will be worth the capital outlay necessary to save them.

The heavy sand from the hydraulic classifiers will pass to some form of classifying sieves, designed to handle a large bulk at a minimum of capital and current expenditure. These should size from 5/16 to say ¼ in., and must be of simple and durable structure, or the placer miner will never bother with them.

To size all of the material from a placer mine, to reduce the product to be treated to a minimum bulk, economically and without loss, and to deliver it in a form suitable for further concentration and treatment, is a matter that offers a broad field for intelligent design and invention. The quantity and proportion of this sized

product to the original gravel will vary according to the nature of the gravel being mined, and judging from my own experience, it will be least in modern river channels and greatest in deep, ancient deposits, and may vary from 20 to 60% of the original gravel in place.

Some form of concentration must now be adopted to treat the fine material, and although cocoa matting tables with expanded metal riffles have been used fairly successfully for the purpose, they are to be condemned because they are not continuous in operation, and all forms of non-continuous concentration are bad, owing to the fact that the surfaces choke and the values commence to slide over and are lost. This can be mitigated to a certain extent by frequent clean-ups, but this entails too great an outlay for current expenses, and quickly reduces profits when treating such a low-grade product as the sand of a placer mine.

The Pinder concentrator has been proved by actual tests to be one of the best machines on the market for this purpose. Its capacity is about 40 tons per day, equivalent to handling the product from 60 to 100 cu. yd. of gravel. Furthermore, it is capable of delivering three grades of concentrate and tailing. Any form of concentrator, however, could be adopted, according to the ideas of the mine owner, and the results of actual tests will soon prove which is the best machine.

Whatever form of machine concentration is used, whether all the material is passed to the tables or whether another hydraulic classifier is used and the fine is passed to belt machines and the coarse to tables, the resulting concentrate will require still further treatment if a clean separation of the gold, platinum, and other by-products is to be made. My own experiments would indicate the following procedure to be possible: First, dry all the concentrate at a high temperature; in some cases it might be necessary to roast; this is a matter for experiment and research, and the most suitable form of dryer a matter for invention. The amount of resultant concentrate to be handled by this method will be from ¾ to 2 tons per 500 cu. yd. of gravel in place, so that a mine handling 10,000 yd. per day would require a dryer, etc., of a capacity not exceeding 40 tons per day.

The dried product may first be treated by magnetic separation to remove the magnetizable iron grains. Here is another big field for research, observation, and invention, as nearly all of the magnetic separators on the market at present, from various causes, one of which I have already indicated, rob too much gold and platinum. After the magnetizable product has been removed, the product remaining, which is now much reduced in bulk, will require further treatment. At this stage it will probably pay the practical placer miner to ship his product to the smelter, as any further process will doubtless require the services of a skilled metallurgist.

The following suggestion, however, may be of service: Treat with diluted nitric acid; wash, amalgamate (without grinding) to remove the free gold; wash the residue through a fine steel-wire sieve. If platinum is present, this can be dissolved by acids, using about 15 times its weight of aqua regia and precipitate by sal ammoniac. The precipitate of platin-ammonium chloride can be dried and treated by the usual refining methods. Any base metals will probably already have been removed by the nitric acid and amalgamation treatment.

JOHN M. NICOL.

San Francisco, January 5.

THERE are some people who always know which is the north; and others who, if asked suddenly, do not know their left hand from their right; and others, again, who say—or shout—that all men are created equal.

Standardization of Weights and Measures.

The Special Committee appointed by the council of the Institution of Mining and Metallurgy, London, submit the following recommendations:

1. That the word 'ton' shall represent a weight of 2,000 lb. avoirdupois, that the terms 'cwt.' (hundredweight) and 'qr.' (quarter) be abolished and that fractions of a ton be expressed either in pounds or in decimals of a ton.

2. That the 'miner's inch' be understood to mean a flow of 1.5 cu. ft. water per minute.

3. That the word 'gallon' be understood to mean the Imperial gallon of 10 pounds.

4. That all the temperatures be expressed in degrees Centigrade.

5. That gold and silver ore-values be expressed in terms of fine gold and silver and not as 'bullion.'

6. That gold contents be expressed in sterling values as well as in weights.

They also suggest that the following questions be appended to any memorandum that may be issued to the members of the Institution embodying the above definitions:

a. Do you consider the general adoption of the Metric system of weights and measures to be feasible, or would this in your opinion lead to undue dislocation?

b. Have you any suggestion to make as to weights and measures other than those already dealt with which require exact definition?

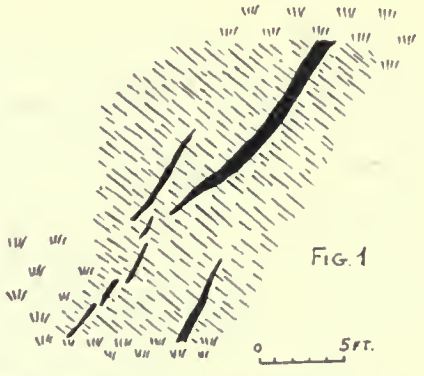
The question of the adoption of Metric standards has engaged the attention of the Committee, as the present movement in that direction in other banches of industry rendered it in their opinion inadvisable to ignore it entirely. The feeling of the Committee, however, is that, while the question should be brought to the attention of the members, it would at present be quite inexpedient to advocate the general adoption of the Metric system. On the other hand an attempt to decimalize existing weights and measures is considered to be a step in the right direction, and as tending to bring about a simplification that would go far to obviate any desire to adopt Metric standards, and this has been kept in view in the foregoing recommendations.

HELMHOLTZ was fond of saying, in proof of the imperfections of the human eye, that he would unhesitatingly reject any piece of work sent to him by an instrument-maker which should prove to be equally full of defects. It is needless to accumulate illustrations of a fact which is familiar to all scientific workers, and which the wisdom of the ages has vainly tried to combat in the aphorism that "seeing is believing." To give only one instance of the untrustworthiness of the human eye, it is still debated whether the so-called canals which the telescope seems to reveal on the surface of Mars are not an optical delusion, due to the inveterate tendency of the eye to arrange separate and unconnected markings into a linear pattern. Any one who has watched a really good conjurer is well aware that seeing is not always believing; we see him quite distinctly take a coin out of his left eye and convert a playing-card into a white-rabbit; but all the same we do not believe that he does it. Yet it is almost entirely through the medium of this imperfect and deceptive instrument that we are obliged to prosecute those researches into the nature of things which, under the generic name of science, have done so much to change the conditions of life, and the outlook of mankind upon both the material and the spiritual universe. Fortunately, we are able to check the messages which the eye sends to the brain by the indications of other senses, as well as to supplement its native weakness by instrumental aids.

Dikes.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES F. KEMP.

The accumulated observations of many geologists have taught us that eruptive rocks occur in the following forms: Dikes, necks, stocks, surface flows, intruded sheets, laccoliths, bysmaliths, conoliths, and batholiths. Some of these names are merely introduced here to excite the curiosity, or (it may be) the alarm, of readers of the PRESS, but the others evince their face-value on sight. Of them all, the one most often concerned with mining is the dike and it is the one which, in many respects,



Very small dikes, near Schroon lake, New York. The country rock is gneiss. Report N. Y. State Geologist, 1895, p. 600.

presents the most interesting features. The larger forms chiefly manifest themselves as so much wall-rock which extends far and wide. For example, the close association of a porphyry dike with a vein in the desert region of southern Nevada and California is its surest claim to the respect and considerate attention of the prospector.

A dike is a relatively long and narrow body of igneous

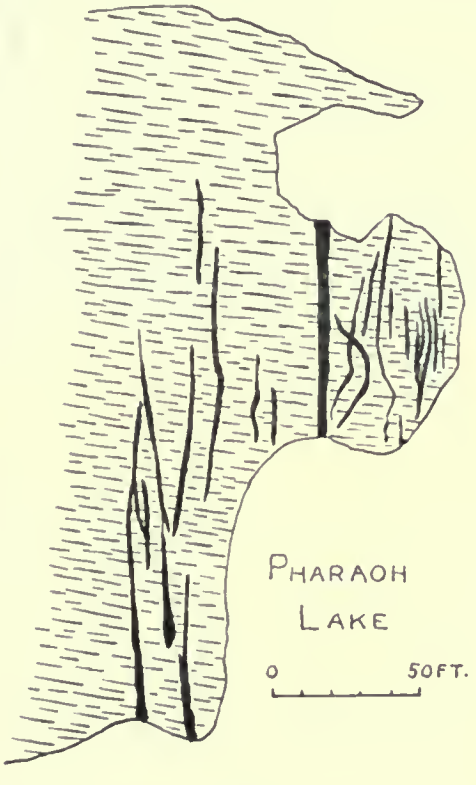


Fig. 2.

Small dikes on the shore of Pharoah lake, southern Adirondacks. Report N. Y. State Geologist, 1895, p. 599.

rock, which has been forced, while yet molten, into a fissure in older rocks. In typical cases dikes are approximately vertical, and in sedimentary rocks they cut across the stratification. It is necessary to mention these features, in order to distinguish them from intruded sheets, which are parallel with the bedding and which are, in typical cases, approximately horizontal. If, however, a steeply-dipping or vertical sedimentary series is penetrated parallel with the stratification by long and narrow bodies of eruptive rock, the distinction becomes less pronounced. Sheets, however, do not cross the bedding, unless for short distances they jump from plane to plane, only to resume their original course. But it is evident, on reflection, that intruded sheets in steeply-dipping sediments present transition forms to dikes.

Dikes, as exposed, vary from the fraction of an inch in width and a few feet in length, to hundreds of yards in width and miles in length, the main point being that

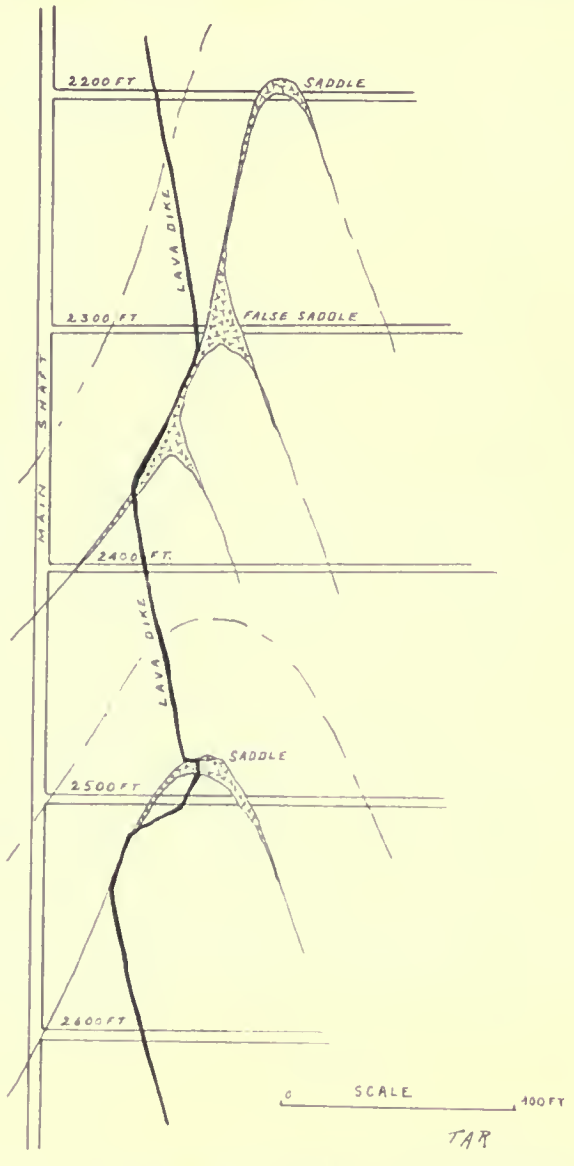


Fig. 3. Nine-inch Dike in the 180 Mine at Bendigo, Australia.

the width is small as compared with the length. When the length becomes relatively small and the width relatively large, dikes pass into stocks and necks, which thus constitute limiting forms. The small size is one of the most remarkable features. In the eruptive and metamorphic areas of the Adirondacks, little basaltic stringers are sometimes seen, scarcely half an inch wide, and no more than a foot or two in length, yet always in groups and making the observer conclude that the molten rock has searched out every nook and crevice in the walls, as would so much water under pressure.

The extraordinary persistence of these narrow bodies without great change in width is very striking. Many examples may be seen along the coast of Maine, New Hampshire and Massachusetts, where, for several hun-

dred yards, a dike will be less than a foot in cross-section. The same persistence holds good in depth. In the 180 mine, at Bendigo, in Victoria, Australia, where the saddle-reef is the characteristic goldbearing formation of the region, a basaltic dike has been followed to a depth of 2,600 ft., without varying much from its width of nine inches, as first discovered at the surface[1].

At the other extreme, however, very large dikes have been recorded. The late Carvill Lewis[2] traced one of diabase in southeastern Pennsylvania, for 90 miles. In following dikes over such an extended area the observer cannot always secure actual outcrops, but must connect scattered exposures, which are ranged, however, along the same line. He must assume the presence of the eruptive beneath the soil, the forest, and the loose surface deposits. He should always endeavor to check the inference by lines of boulders in unglaciated regions. In glaciated regions, of course, boulders have no local significance.

Dikes rarely occur singly; it is the rule to find them in parallel series, but large individuals almost always send branches into the wall-rock. This relation may be of great practical importance, as is illustrated in the Gogebic iron range of Michigan. The iron ore deposits are due to the troughs, which are made by northerly dipping dikes with southerly dipping quartzites, on which rest cherty iron carbonates. Both quartzites and dikes being impervious rocks, the iron ore which has been leached out of the cherty carbonates has come to rest in the troughs and has been precipitated. The parallel and branching dikes have brought about repetitions of the troughs and have thus multiplied the number of ore-bodies. Ore having been penetrated or exhausted in one trough, another may be found by following down on the quartzite.

When platted on a map, the parallelism of scattered and poorly exposed individuals over wide areas may sometimes be brought out in a marked manner, as has been proved to be the case in the Adirondacks. They may then be shown to follow systems of joints or faults, and—conversely—emphasis is to be placed on the importance and deep-seated nature of the joints or faults themselves. In the Adirondack case, basaltic dikes, which were noted in exposures miles apart, and among which no relationship was at the time suspected, were found to follow one marked series of structural breaks.

Dikes are at times wonderfully numerous, and afford one of the most striking of geological phenomena. The coast of Massachusetts, New Hampshire, and Maine, is thickly seamed with them. A. C. Lane[3] has recorded upward of 500, nearly all diabase, at the shore resort of Nahant, a few miles north of Boston. The entire area is little more than a square mile, and the dikes constitute from 3 to 6% of the total surface. N. S. Shaler and R. S. Tarr,[4] have mentioned the great numbers at Cape Ann, and have speculated on the compression which their intrusion must have produced in the country rock.

Dikes sometimes radiate from an eruptive centre. For them, when in this position, L. V. Pirsson[5] has suggested the name 'radial' dikes. The Little Belt (Montana) folio of the United States Geological Survey, shows some remarkable cases. The radial dikes in this case are basic or low in silica, while the eruptives of the central mass are relatively rich; hence the dikes are also spoken of, as complementary to the other eruptives; the two together making a mass of average composition.

In a few observed cases two dikes have successively entered the same fissure so that a composite dike has been afforded.[6] And again instances are known in which the same dike has split up into numerous thin masses as it penetrated the shattered rock. A. C. Lawson has described a case at the mouth of White Gravel river, on the northwest coast of Lake Superior, in which over fifty thin sheets of granite and diabase alternate, no one of them over 6½ in. across. The diabase is the younger and the dike has been called a 'multiple' dike by Lawson.[7] Zirkel[8] has mentioned a dike of such varying composition across its face as to be called a 'mixed' dike.

The mass of a dike is sometimes found to be richly charged with fragments of the wall-rock through which it has come. When these are collected and compared, they indicate the underlying formations. Thus a dike of trachyte at Nash's Point, on Lake Champlain, near Burlington, Vermont, contains (as inclusions) fragments of Trenton limestone, Cambrian sandstone and Archæan anorthosite, the wall-rock being Utica slate. From the known geological section it is inferred that the anorthosite came from not less than 1,000 ft. in depth.[9] The presence of abundant inclusions of this character indicates that the portion under observation is the advanced guard of the eruptive, as it was forced into the fissure. When the fissure was first produced there would naturally be much splintering of the wall-rock, but as the advancing portion of the dike passed on, it would carry with it the loose materials and finally embrace them in this upper portion when it came to rest. Dikes which have been eroded to any notable extent apparently do not contain these inclusions.

The enormous pressure under which these narrow bodies of eruptive rock must have been forced into fissures in order to split apart the wall-rocks has attracted the attention of some observers. N. S. Shaler[10] has suggested that when a dike penetrates rock which is well provided with water, the heat of the dike probably vaporizes the water as fast as encountered, and thus produces explosive steam which opens up the way. Whether this appeals to us or not, there is no escape from the conclusion that the hydrostatic pressure back of these entering wedges of molten material is enormous.

When the molten rock comes to rest in a fissure, especially in its upper portions, it speedily congeals and crystallizes. Almost always the portions along the contact and the narrow off-shoots show evidence of having quickly chilled. They are glassy or extremely dense. As, however, the central portions of even narrow bodies are approached, the crystals become larger and porphyritic or even certain varieties of granitoid texture may be attained. In large dikes in which the structure is granitoid, we find the minerals, almost all possessing their own crystal boundaries, and affording a texture fairly characteristic of this form of eruptive. Since the coarseness increases regularly from the edge to the centre, the size of the component mineral bears a definite relation to the original temperature, the conductivity of heat, and the temperature of the walls. Both A. C. Lane and later A. J. Queneau[11] have developed formulas whence, from measurements of the size of the minerals, the distances from the edge may be calculated and likewise the temperature of the molten dike at the time of entrance. Mr. Queneau endeavored to develop a method whereby, when a miner was penetrating a dike or sheet of barren rock, measurements of the size of the crystals, of necessity with the microscope, would give an idea of the distance yet to be traversed to reach the farther wall.

Dikes have frequently been shown to be more basic or

[1] T. A. Rickard. *Trans.* Amer. Inst. M. E., Vol. XX, p. 485.
[2] H. Carvill Lewis, *Proceedings* American Philosophical Society, Vol. XXII, p. 438.
[3] A. C. Lane, *Proceedings* Boston Society Natural History, Vol. XXIV, p. 93, 1888.
[4] *Ninth Annual Report*, United States Geological Survey, p. 579.
[5] *American Journal of Science* August, 1895, p. 116.
[6] J. W. Judd, *Quarterly Journal*, Geological Society, 1893, p. 536.
[7] *American Geologist*, May, 1894, p. 293.
[8] Lehrbuch, Vol. I, p. 784.
[9] *Bulletin* 107, U. S. Geological Survey.
[10] *Bulletin* Geological Society of America, Vol. X, 1899, p. 253.
[11] A. C. Lane, *Bulletin* Geological Society of America, Vol. VIII, 1897, p. 403. A. J. Queneau, School of Mines Quarterly, 1891.

lower in silica at the edges, and more acidic or higher in silica at the centre. During crystallization the metallic bases seem, by some obscure process, to move toward the coldest portion, either by molecular transfer or flow, or else by convection currents. The change is somewhat analogous to the varying values in a solidified pig of base bullion from top to bottom, or from outside to inside, and to variations well recognized in chilled pots of copper-nickel-iron mattes. In a dike, the contrasts may be several per cent in silica. The changes have a bearing on the supposed igneous production of certain ores, and may at least make some parts, the outside for instance, more favorable for replacement processes than the inside. Sometimes when a large mass of eruptive rock has been partially congealed, it appears to have been cracked by the contractions from cooling, so that material, still molten below, has exuded into the fissures and has afforded dikes called 'extravasated' by W. O. Crosby. Dikes themselves may break up, from contractional strains on cooling, into basaltic columns whose long axes are perpendicular to the walls. The columns may be left in relief by the erosion of the wall-rock, so as to appear like masonry, or even like cord-wood, or again the dike may be removed leaving a narrow gorge, with an apparent stairway at the back. The coast of northern New England, above referred to, has many cases of the latter type. Dikes left in relief rather favor the more arid regions, and remarkable cases occur around the Ortiz mountains of New Mexico, and on the Spanish Peaks of Colorado.

The relative age of dikes is occasionally indicated by their intersections, the younger cutting the older. An exceptionally well exposed and interesting case is afforded by Lighthouse Point, near Marquette on Lake Superior. The country rock is a schist, produced by the metamorphism of a volcanic tuff. It has been cut by five successive intrusions of dikes. The oldest dike is cut by the other four, and so on down to the latest, which itself cuts all the rest. See Fig. 5.

Although dikes are themselves relatively small masses of eruptive rock, they indicate large reservoirs in depth, because it is inconceivable that they can have been produced in any other way, than as smaller offshoots of much larger bodies. They are found in regions remote from large masses of igneous rock, so far as surface exposures go, and amid geological surroundings where they would be least anticipated. For instance, at Syracuse, N. Y., and south of it, in the almost undisturbed Paleozoic strata, a goodly number has been discovered. Again in southwestern Pennsylvania, cutting as high as the Pittsburg coal seam, one is known, and in eastern Kentucky, several others, likewise in the coal measures. Isolated dikes, like these, are almost always very basic rocks, and usually peridotites. They make us wonder if it is safe to infer the underground absence of igneous phenomena in any quarter.

Fig. . Upstanding Dikes on the Flanks of Spanish Peaks, Colorado.

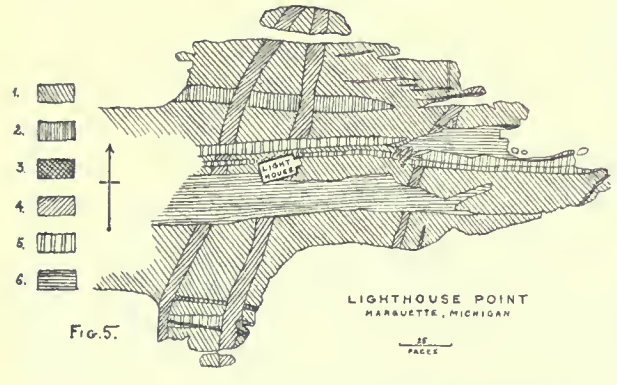
By Courtesy of U. S. Geological Survey.

Dikes sometimes exercise an important influence upon the local fertility of soils. In the wash of the well-known nephelite-syenite dike, a rock rich in potash, near Beemerville, N. J., the land is very productive. From Norway, however, we draw the most striking instance. As described by Dr. Kolderup, of Bergen, there is, near the village of Soggendahl, a great dike of dialase, extending several miles across a country whose rock is anorthosite, or almost exclusively labradorite feldspar. Where the

dike has contributed to the soil it is extremely fertile, and both crops and stock flourish. Back in the hills, on the contrary, the soil is far less fertile and the land is solely used for grazing. The anorthosite lacks phosphorus because of its small amount of apatite, and the cattle show the effects by weak bones and teeth. The farms and villages all follow the course of the diabase.

Dikes have also proved exceedingly serviceable sources of paving materials and in regions of soft country rocks they are quarried extensively for macadam. Basaltic dikes generally yield a road-metal with a good bond. Under metamorphism basic dikes yield belts of hornblende-schist which follow the old course of the intrusive with great fidelity.

In mining districts, dikes occasion particular interest. They have sometimes caused unnecessary alarm on the part of miners. Thus many years ago a basaltic dike, about 20 ft. thick, was encountered in mining the zinc ore at Franklin Furnace, N. J. It happened to cut the orebody, just where the latter pitched down beneath a cap of limestone, so that it was not apparent that the ore continued beyond the dike, and for awhile it was supposed that the eruptive had cut it off. The dike was hard and tough, resistant to the hand-drilling of the day,



Intersecting dikes at Lighthouse Point, near Marquette, Mich. The order of age is: 1, hornblende schist; 2, crushed felsite; 3, microgranite; 4, uralite diabase, altered; 5, uralite diabase; 6, quartz diabase. Geological Survey of Michigan, Vol. VI., p. 230.

but, when finally penetrated, the best ore of the mine up to that time, lay just beyond it. A similar experience for awhile caused some alarm 25 years ago in the Forest of Dean magnetite mine, southwest of West Point, N. Y. A basaltic dike cut the ore off, but in the end it proved but a few feet thick. In the magnetite mines of the Adirondacks, narrow trap dikes are met in almost all the slopes and very often occupy small faults along which the ore is thrown a few feet.

The presence of dikes in association with ore deposits, other than iron, is suggestive of the influence of eruptive processes upon the formation of ore. If it is appreciated that even a small dike is proof of the existence of a large parent body of igneous rock, in depth, and of a line of weakness leading down to it; and if the dike has entered just before the formation of the ore, the inference is inevitable that expiring igneous phenomena are connected with the deposition. Many such cases could be cited from Western mining regions. Thus at Douglas Island, Alaska, G. F. Becker noted a narrow basaltic dike in association with the ore. The introduction of the auriferous pyrite was supposed by him to have occurred simultaneously with the entrance of the dike or soon after. At Cripple Creek, Colo., the telluride ores are closely associated with phonolite and rare basaltic dikes, all appearing to be the closing products of the local volcano. In fact it is very exceptional in the West to find a camp where dikes or some related form of eruptive rock are not in close association with the ores.

Pegmatites constitute a connecting link between ordinary intrusive dikes and veins. They seem to have been formed by aqueo-igneous processes, so that one is often puzzled whether to call them dikes or veins. They shade off into quartz veins by imperceptible gradations and have much in common with the latter.

A very peculiar form of rock which is not igneous, but which has been described under the name dike, is the so-called 'sandstone dike,' first brought to general attention by J. S. Diller from observations in California. Long and relatively narrow masses of sandstone have in a few instances been discovered in fissures, which cut sharply across the stratification of sedimentary rocks. It is believed that they have been introduced as mud, in connection with earthquakes, and having been once poured into a fissure as an emulsion, they have then consolidated into firm rock. Although unfortunately called 'dikes,' they are nevertheless in no sense igneous. In the use of the words dike and vein, we should be equally careful to restrict the former to igneous intrusions, the latter to deposits from solution.

AMERICAN COPPER.—As recently as 1888, says '*The Copper Handbook*,' by Horace J. Stevens, the value of copper produced by the mines of the United States was only $33,833,954, and for 1904, only two years ago, was but $105,629,845, the year 1904 being the second in the history of the country in which the value of the copper output exceeded one hundred million dollars, yet, at the present moment, the copper mines of the United States are producing copper to the value of two hundred millions of dollars yearly, and the Lake Superior copper mines alone are making copper worth $150,000 for every day in the year, or at the rate of more than one million dollars weekly. So great has been the growth of the industry, and so rapid the increase in price of the metal, that the production of three counties of the single State of Michigan is as great in value as the entire copper production of the United States as recently as 1897—only nine years ago—and double the value of the entire copper output of the United States in a year as comparatively recent as 1889.

Figuring copper at an average price, throughout the globe, of 20½ cents per pound, which is a trifle below the average quotations, the mines of the world are making copper at the rate of exactly a million dollars per day, for every day in the year, including Sundays and holidays.

Compared with copper, the value of the gold and silver production in the United States is as a minor fraction, great as is the output of the precious metals, and rapid as has been the increase in production of the money metals by the mines of America. Another fact of deep interest is found in the surprisingly large percentage of the gold and silver output of the country that comes, as a by-product, from the copper mines. The vast and rapidly increasing value of the copper output of the United States, which makes more than half of the copper produced in the world, is a most significant development.

THERE is good reason to suppose that the first principles of microscopy were known in very early times. Layard dug up a convex lens of rock-crystal among the ruins of Nineveh, and it is practically certain that the exquisite gems of the ancient world could not have been cut in their minute detail without some such aid.

THE inclination and ability to view a question from the historical standpoint is of the same importance in the education of the scientific investigator as is the inclination and ability to do careful and conscientious experimental work.

Tredinnick's Process for Desilverizing Lead.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

The Pattinson process is based upon the fact that when lead containing silver (base bullion) is melted in a large kettle and is afterward suffered to cool to a temperature near its melting point, small crystals begin to form in the molten metal which, as they are produced, sink to the bottom, and, on being removed, are found to contain about half the silver of the original lead, the rest having been retained by the still liquid metal. If the crystals are removed to an adjoining kettle, melted, and the process repeated, crystals of lower grade are again obtained, and thus by using a series of kettles for the successive separations we finally obtain a market-lead almost silver-free. On the other hand, the still fluid alloy of the original pot treated in successive kettles on the opposite side may be gradually enriched up to 500 oz. silver per ton. This enriched product may then be treated by the Parkes process for a rich lead of 5 to 10% silver and the rich lead cupelled to obtain silver bars or ingots.

The Luce & Rozan improvement on this process consists in the use of high-pressure steam, whereby the lead is effectually stirred and the contained impurities oxidized. At the same time, water is sprinkled on the surface of the charge, quickly cooling the mass to the critical temperature for the formation of crystals. Moderately soft base bullion, up to one per cent in copper and antimony, can be refined by this method without preliminary softening; indeed the presence of those metals is rather an advantage, since they prevent undue drossing of the lead.

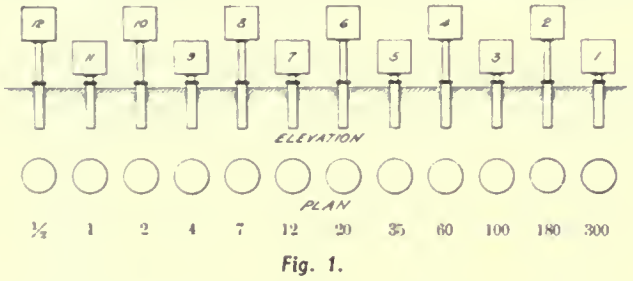


Fig. 1.

An improvement invented by Stephen Tredinnick consists in abolishing the melting pots and the steam cranes required to raise the base bullion (one-third liquid to add to the two-thirds crystals). In place of this, he uses a train or series of twelve crystallizing kettles of 50 tons capacity each. Each crystallizer is supported by a hydraulic ram, by which it can be raised at will, thereby enabling the lead to be run from kettle to kettle of the series as required.

Fig. 1 shows in plan and elevation the arrangements of the crystallizers, in which the kettles contain lead of the grade in ounces written directly under them in the plan. Beginning the operation, we will assume No. 2, 4, 6, 8, 10, and 12 to be full, ready to be crystallized and to be operated upon. The intervening crystallizers, 1, 3, 5, 7, 9, and 11 will be empty and already lowered to receive their respective charges. The one-third liquid from the crystallizer at the right and the two-thirds crystals from the adjoining kettle on the left complete the new charges. The one-third liquid from kettle No. 1 is discharged either directly to the zincing kettle or into molds for further treatment by the Parkes process. The two-thirds crystals in 12 are melted and discharged to be molded into market-lead. The odd-numbered kettles are now raised, treated by blowing through high-pressure steam and cooling with water to bring the lead to the temperature of crystallization. The even-numbered pots are then lowered in their turn to repeat the first maneuver.

Fig. 2 is a sectional elevation of one of the kettles with its hydraulic ram. The 50-ton kettle is shown surrounded by a brick-lined casing, within which circulates and burns the fuel gas, by which the kettle is heated. A steam pipe sliding through a gland gives a flexible connection to the high-pressure steam-supply, and this steam can be introduced beneath a baffle-plate, which distributes its flow evenly throughout the lead. The cover has a central opening for the escape of the fumes and hinged covers by which access may be had to the sides of the kettle for removing a crust formed

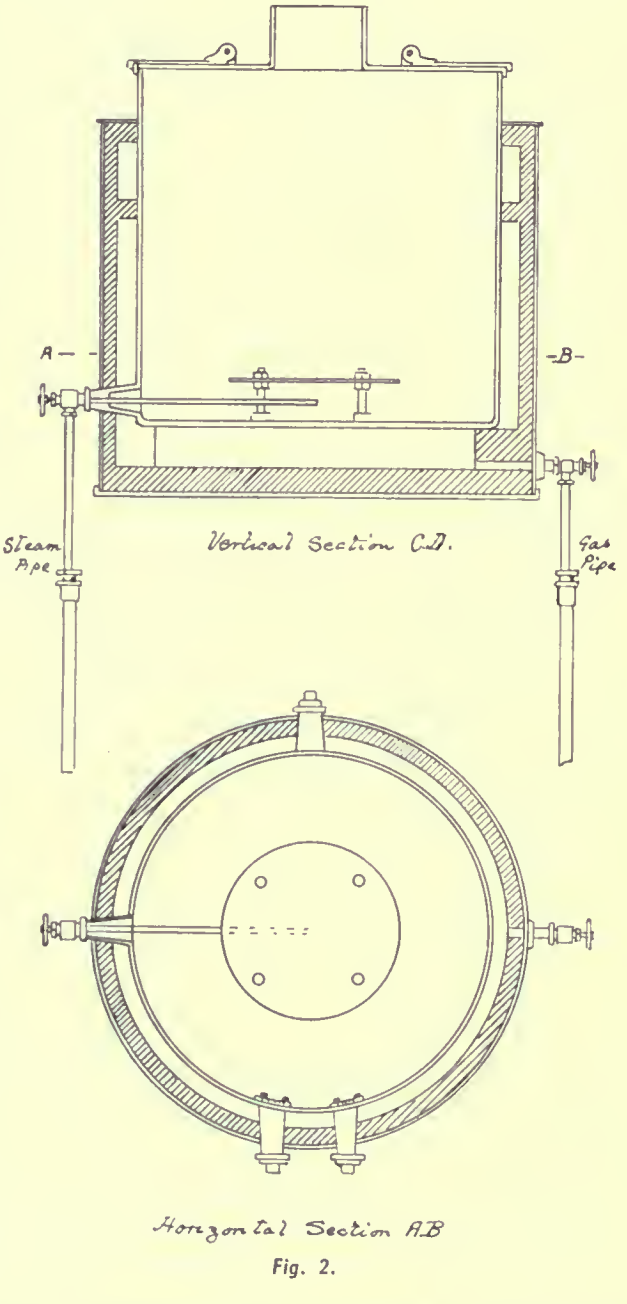


Fig. 2.

during the steam-poling. The outlet at the left has a strainer on the inside to prevent escape of the crystals, while at the right the crystals having been melted flow away freely.

The cost of a single operation may be thus given:

Fuel gas—10,000 cu. ft. at 5c. per 1,000	$0.50
Labor for one operation (for 12 operations, 3 men @ $3 $9)	0.75
Superintendence for one operation ($6 per day for 36 operations)	0.17
Steam for crystallizing	0.05
Tools and repairs	0.10
General expense	0.20
Total	$1.77

The stock of lead needed for the series is 300 tons. Low-grade bullion can be treated more easily and cheaply even than that of high grade. Thus Missouri lead, con-

taining one or two ounces per ton, could be treated at a profit. The lower the grade the fewer the operations necessary to arrive at the No. 12, so the cost of refining will be proportionally cheaper.

Thirty-three tons of 300-oz. base bullion can be desilverized in 12 operations, so we have $\frac{1.77 \times 12}{33} = 64c.$ per ton. The above is calculated upon the basis of receiving the fresh lead in a molten condition from a storage pot where it has been melted. To the 64c. must be added the cost of molding the market-lead. The desilverizing of the final 500-oz. product must also be added.

Pattisonizing is the most satisfactory method of treating lead containing bismuth, which is not removed in the Parkes process. On account of the low temperature at which the process is carried on, there is a gain in silver of from two to four per cent. In treating reasonably clean base bullion containing no more than one per cent of antimony, these metals are no drawback to refining, so that the total of dross produced is even less than that made in the Parkes process.

Mr. Tredinnick operated the Luce & Rozan process for upward of ten years at Eureka, Nevada, and his improvement is the result of extended experience.

Mr. Tredinnick himself says: "The number of operations necessary to enrich and impoverish the bullion is the same with the different methods, namely, concentrating a portion to 500 oz. silver and impoverishing the larger portion to one-fourth of an ounce of silver per ton. With the original Pattinson method, using kettles with 10 to 15 tons capacity, they performed from three to four operations per 12 hours. With the Luce & Rozan method and employing the largest kettle, we performed five operations per 12 hours. The time required to crystalize and run off the liquid was 20 minutes; we then had to wait nearly two hours for the melting of one-third liquid of a previous series of the following grade to add to the two-third crystals to re-fill the kettle to be operated again. With my improvement, using a kettle of 50 tons capacity and allowing 40 minutes to perform an operation, we can complete 12 operations per eight hours.

We aim to keep the bullion at as low a temperature as possible all through the several operations of the series. The bullion is just hot enough to skim clean; when skimmed the steam enters at the bottom of the kettle and two jets of water play on the surface of the bullion. It takes about 20 minutes to do the work, that is, to get two-thirds of the contents of the kettle into a crystalline state and run the one-third liquid into the adjoining kettle on the left. The workman shuts off part of the steam and water two or three times during the operation, while he cuts down the lead that has splashed around the upper part of the kettle. When the one-third liquid is run off, the valves are closed; the crystals are then melted and moved into the adjoining kettle on the right, to be mixed with the liquid from the next higher number kettle.

The liquid is run off in one direction of the series and the crystals in the opposite—the liquid toward the No. 1 kettle and the crystal toward the No. 12.

With high-grade bullion, say, from 200 to 300 oz. silver per ton, two crews of three men are required to operate the series. With low grade, say, lead containing from half an ounce to 20 oz., only one crew of three men will be required."

It would appear that little has been done of recent years in attempting to treat low grade bullion or the large output of Missouri lead containing a few ounces of silver, and that large profits await those who would undertake to treat such material, as well as such scrap-lead as contains silver.

Production of Chlorine From Salt.

It may be of interest to millmen who use chlorine in the extraction of gold to know that during this year the West Virginia Pulp & Paper Co., has been using the Hargreaves-Bird electrolytic cell at their Piedmont works in West Virginia under license from the General Electrolytic Parent Co., Ltd., of Middlewich, England, which is the owner of the American patents. The West Virginia company adopted this process after testing other methods and is now enlarging its plant. The Hargreaves-Bird cell is 5 ft. high and 10 ft. long, it has one set of anodes made out of gas carbon and two sets of metallic cathodes; the cathodes are separated from the anode by diaphragms that permit the sodium to pass to the cathode but do not allow the chlorine or the brine to pass through. The particulars given below of the work done in the month of May, 1906, at Piedmont with 16 cells, will enable engineers to work out the cost of production of chlorine at their own mines.

Amperes	2,600.00
Volts	56.92
Volts per cell	3.56
Electric horse-power used in cell room	198.50
Total electric horse-power used by plant	270.00
Steam used boiler horse-power	24.70
Current efficiency	90.00
Na_2CO_3 (soda ash) produced in 31 days	120,900 lb.
Chlorine gas produced in 31 days	81,511 "
Limestone used to produce CO_2	217,758 "
Coke used to produce CO_2	31,000 "

Each cell produces chlorine equivalent to 469 lb. of 35% bleach per 24 hours, also 243.7 lb. carbonate of soda. The cost of each cell, including royalty in England, is about $1,000. Repairs on a Hargreaves-Bird plant amount to about $1.25 per ton of bleach produced. The advantages of chlorine gas without lime (as in bleaching powder) for gold extraction are obvious.

THERE are some differences to be noticed in the various sciences. In the natural sciences the current periodicals contain a complete record of the direct progress of research. In comparatively few instances are new facts and thoughts first confided to the pages of a book. When the investigator wishes to study the literature of any subject he usually confines his search exclusively to these periodicals, and uses books only when he hopes to find in them more or less of the required information already compiled. In the science of medicine the method of procedure is in general quite similar, although the results of original researches are not infrequently published in book or pamphlet form. The other sciences may be arranged in a series in which this preference for the journals becomes less and less marked, until in the case of philosophy the other extreme is reached where the book has the upper hand. There appears to me, however, to be a noticeable movement toward the first mentioned state of affairs. This change is above all things being brought about by the fact that at the present time it is becoming more and more necessary for each scientist, on account of the active competition in his field, to publish his results as quickly as possible in order to obtain credit for them. This result is most easily obtained by means of a short magazine article. This also explains the extraordinary volume of the scientific literature of the present day; for in addition to heavy gold particles, from which later will be made valuable coins and beautiful ornaments to add to the intellectual wealth of mankind, it also contains unproductive material in great quantities, which will be swept away by the current of time, while the grains of gold remain.

A STATEMENT of the value of the various industries in Alaska shows that the fisheries lead all others, the production from 1878 to 1905 aggregating $96,000,000.

An Adaptation of the Stadia to Small Scale, Reconnoissance Surveys.

Written for the MINING AND SCIENTIFIC PRESS
By R. H. CHAPMAN.

During the progress of reconnoissance surveys recently undertaken by the writer, it became desirable to meander certain streams in order that they be mapped accurately enough to tie them to the corners of United States Land Surveys, and to locate houses along the valleys. The region was open, rolling prairie, entirely devoid of timber, of comparatively low relief except in such portions

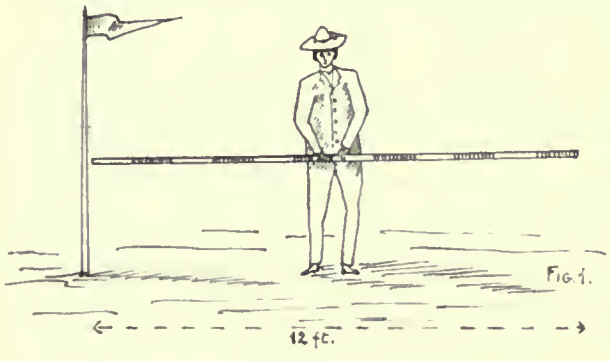


Fig. 1.

as were marked by the feature of cañons cut through a plateau, which was represented by remnant mesas rising in places about 300 ft. above the stream.

The usual method of wheel traverse would have been adequate for the horizontal factor, but to obtain elevations the aneroid ordinarily used in such work was eliminated on account of a high daily range, from one-tenth to three-tenths of an inch, and by irregular and abrupt changes due to local thunderstorm conditions and heavy winds. At the scale used, one inch to four miles, a fortieth of an inch equalled one-tenth of a mile, or 528 ft., and as platting to one-eightieth of an inch, 264 ft. was as close as could be accomplished, extreme accuracy was not necessary. The rod used was of the 12-ft. jointed variety, painted red and white in alternate foot-lengths. The telescope of the instrument was of the form ordinarily in use by the Geological Survey, which is so arranged as to turn 180° in the barrel carrying the trunnions, in order that adjustment for errors in colimation may be made without removing it from the Ys, and it has stadia wires in the ratio of 1 to 100. In using the instrument in the usual way, the limiting sight-length was 2,400 ft., using half the stadia-wire interval, and this was too short to be economically available, since the possible mileage per day was not warranted for the scale of work. The rodman worked on horseback and therefore a much longer rod was impracticable. He was supplied with a flagged range-pole, with a long slender iron spike in one end. Upon reaching a rod point, the range-pole was placed vertically and so maintained by the long spike thrust deep into the ground, and the rod was held horizontally with one end against the range-pole. The telescope of the instrument w turned 90° in the longitudinal axis, the stadia wir becoming vertical, and in sighting the rod one wire was placed so as to co-incide with the vertically placed range-pole. If the half-interval wire cut beyond the end of the rod (if the distance to be measured was more than 2,400 ft.) the rodman was signaled and measuring the rod-length on the ground, he held the rod *one length* further from the range-pole. (See Fig. 1 and 2).

This was repeated until the half-interval wire cut the rod, when by means of having counted the number of times that the rod was moved and adding that part of it included on the range-pole side of the wire, the distance was obtained and recorded.

Elevations were measured by vertical angles in the usual way, as the rod was horizontal and held at about the height of the instrument, and the horizontal wire was placed on the rod, the corrections for H. I. and slope, were elimiuated.

In this way many miles of line could be run in a day without appreciable error, and reasonable checks in height made. The longest sight so far made is 7,800 ft. and the best day's run about 12.5 miles, with an elevation check within 10 ft. This is as close as necessary, the contour interval being 50 ft. With practice and by doing away with the necessity of each day returning many miles to camp, there is no reason why the stadia party, instrument man and rodman, should not make 20 miles a day in such open country as that in which the method originated.

Great accuracy is not claimed for this method, but for reconnoissance work it is all that is desirable.

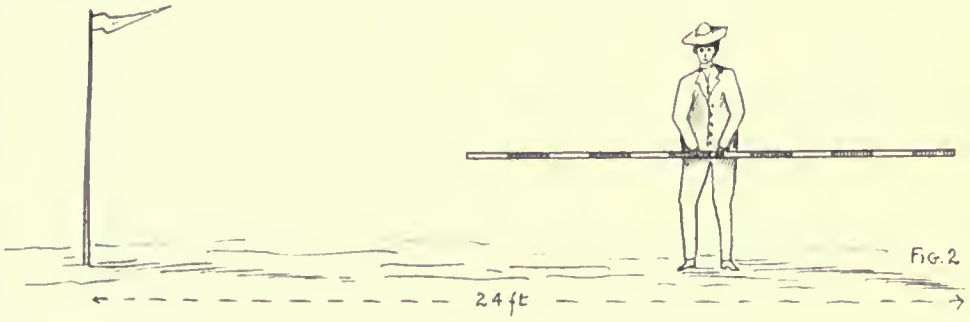


Fig. 2.

MECHANICAL APPLIANCES must have been adopted at a very early period, otherwise the huge blocks of granite quarried at Assouan, many of them varying from 18 to 60 tons weight, could not have been transferred and erected at the Pyramids, etc. To what extent these appliances were based upon actual scientific knowledge it is difficult to say, but, in any case, engineering may reasonably lay claim to being one of the learned professions from about 400 B. C., when Archytas, the reputed inventor of the screw, who died about 391 B. C., and Eudoxus, who died 352 B. C., both of whom were geometricians and philosophers, turned their thoughts to mechanics; but Plato inveighed against them with great indignation as corrupting and debasing the excellence of geometry, and making it descend from the intellectual to the practical; so that for some time applied mechanics were despised by the philosophers, and considered as simply a branch of the military art. The ancient philosophers esteemed it an essential part of learning to conceal their knowledge from the uninitiated, as they considered its dignity was lessened; and even went so far as to regard the introduction of mechanical subjects into the region of philosophy as a degradation of a noble profession.

WHEN capitalists are numerous and capital is abundant, work is plentiful and wages are high. Capital and labor are Siamese twins which can only be separated by killing them both.

An Electric Storm.

The accompauying illustration of an extraordinary lightning flash and thunder-cloud, we owe to Mr. A A. Forbes, who took the origiual photograph at 9 P. M. on July 25, 1906, at Bishop, Inyo county, California. It is an impressive display of atmospheric electricity and suggests destructive power. We are not informed that anyone was injured on the occasiou of this wonderful manifestation of energy.

It is 167 years since Benjamin Franklin identified the lightning flash with the electricity developed by a frictional machine. He used his celebrated kites to study the electrification of the air, the kite being provided with a sharp-pointed wire to "draw the electric fire from" the thunder-clouds. In later experiments with more refined methods, McAdie and Henry "obtained potentials as high as 3,000 to 4,000 volts, just before the lightning." Some of the latest experiments were made on the top of the Mills building in San Francisco, the roof of which was (before the earthquake-fire) covered with bitumen, so as to be a good insulator*.

From 700 to 800 lives are lost each year by lightning stroke, say, 1 person in 100,000. Such fatalities are more numerous in the Eastern States, for thunder-storms occur with frequency over all the area east of the one hundredth meridian; west of that meridian, except in the Rocky Mountain region, the frequency of lightning stroke diminishes, reaching a practical zero along the immediate Pacific coast. The region most subject to them is that of the middle Atlantic States.

One of the best explanations of lightning is that of Mr. Alfred J. Henry, professor of meteorology, as given in Bulletin No. 256 of the U. S. Weather Bureau. He says:

"We may, perhaps, better understand the phenomenon of a lightning flash by noting the similarity between it and the discharge of a Leyden jar. The Leyden jar, it may be remembered, consists of a glass jar, coated both inside and out with tin foil for about four-fifths of its height. The mouth is closed by a cork, through which passes a metallic rod, terminating above in a knob and connected below with the inner coating, usually by a chain depending from it. The two coatings of the jar obviously serve as collecting and condensing surfaces and form, in connection with the glass jar, what is known in electrical terminology as a condenser. The capacity of a conductor may be enormously increased by bringing near it another conductor connected with the earth. This process is called 'condensation of electricity.' If the inner coating of a Leyden jar be connected with an electrical machine and the outer with the earth, the former will acquire a positive and the latter a negative charge. If now a metallic rod be brought near the two surfaces of the jar, a spark is obtained whose power depends on the potential of the iuner coating and on its electrical capacity.

"If the jar has not been charged beyond its capacity, it will retain its charge, under favorable conditions, for many days. If, on the other hand, the inner coating has been too highly charged, partial discharges, invisible except as a phosphorescent glow in the dark, will occur from the inner to the outer coating until equilibrium is restored. Again, if a jar be subjected to a sudden rush of electricity it will overflow, that is to say, sparks will pass along the glass from the inner coating up over the lip of the jar and down the other side to the outer coating. Thus, we have seen that the overcharge of a jar may be dissipated by weak, partial discharges and also by a true spark discharge of some violence. The analogy between these two forms of discharge and what occurs in nature may be better conceived when we consider the layer of clouds as one coating of the jar and the surface of the earth as the other, while the air between takes the place of the glass of the jar. The glass of the jar, or in fact any insulating substance between two charged surfaces, is called the dielectric, and it is this dielectric of non-conducting air between the clouds and the earth that we live.

"In ordiuary fine weather the upper regions of the atmosphere are at a different potential from the earth, but the difference in potential or pressure, if we may use the last term, is not great enough to produce a discharge. The sparking distance is too great, and, as in the case of the Leyden jar, no discharge will take place so long as the electrical tension remains unchanged.

"It is well known that certain conditions of temperature, atmospheric pressure, and moisture favor the development of thunderstorms. Under such conditions the potential difference between the cloud on one hand and the surface of the earth on the other is increased, not gradually and for some time in advance of the thunderstorm, but rather suddenly, and more often locally than simultaneously over a large extent of territory. The cloud serves as a condenser of enormous extent, as compared with those used in laboratory experiments, but, nevertheless, the amount of charged surface presented to the earth may not, in the case of summer thunderstorms, exceed a few square miles. We have then, following out the analogy between a Leyden jar and a flash of lightning, a few square miles of cloud as one coating of the jar, an equal area of land as the other, with the air between subject to stress or tension. As in the case of the overcharged Leyden jar, the tension may be relieved by invisible or silent discharges from the top of every rock, building, tree, wire or other metallic object within the strained field, as well as from the under-surface of the cloud. Discharges of this character may and do take place through the human body, especially on high mountain summits, where the discharge at times is so marked as to cause apprehension for one's safety.

"Up to a certain point the air is able to resist the stress in it due to the electrification of the cloud mass. Whenever the stress passes a certain limit, which may be called the breaking point, the air gives way; literally it is cracked from cloud to earth like a piece of glass as the bolt descends. While human foresight is able to say approximately when a flash will occur, it can not say where the air will give way first. The zone of danger is in general co-equal with the area of the storm cloud, although it sometimes spreads out some distance in front of the storm cloud. Almost any upright object in this area is a better conductor than the air in which it stands. The wonder is therefore not that so many persons and objects are struck, but that so many escape.

"The ability of an electric current to break down a core of non-conducting air, depends upon its electro-motive force. A current of 10,000 volts will jump across a space of about half an inch of common air, and hence it has been concluded that a flash of lightning that extends from cloud to earth must have an electro-motive force of many millions of volts. Since many thunderstorm clouds are at least a mile above the earth, we must continue to marvel at the source of the tremendous energy involved in a single thunderstorm.

"The underlying causes of the electrical manifestations in a thunderstorm have not been clearly defined. It is known, of course, that the normal electric field of fair weather becomes disturbed concomitantly with certain other changes in the meteorological conditions, but no such relation as that of cause and effect has as yet been discovered. It is also well known that certain conditions of heat, wind, and moisture are present in the formation

*Lightning and the Electricity of the Air' by Alexander G. McAdie and Alfred J. Henry. Bulletin No. 197, U. S. Weather Bureau.

of thunderstorms, and it is, therefore, suspected that motion of some sort, whether mechanical, as of the wind, causing friction between the air particles, or molecular, as when water vapor is condensed into a liquid, is in some way the antecedent of the disturbed condition of the normal electric field. That there is some connection between the condensation of aqueous vapor and the electrical state of the atmosphere seems quite probable, but just what the relation is does not yet appear. The writer has observed the transformation of a plain cumulus cloud into a thunderstorm on more than one occasion. Rain almost invariably began before there was any other display of lightning whatever. The first manifestations of the latter were usually in the form of light thread-like discharges within the cloud, without audible thunder. As the rain increased and the wind freshened, the electrical discharges became more marked. These observations, though quite fragmentary, evidently indicate that the electrical tension of the air is increased by precipitation."

An Electric Storm at Bishop, California.

CALIFORNIA produces 200 to 250 oz. platinum each year, slightly more than half of it coming from the dredges at Oroville and Folsom.

The Volumetric Estimation of Antimony.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES DARROCH.

All of the gravimetric methods of estimating antimony are tedious and many of them are unreliable, while the dry assay, although fairly expeditious, is notoriously inaccurate. When sodium thiosulphate solution is used for titration (as is generally the case) the iodide method cannot be relied upon, since the 'hypo' is decomposed, with the separation of sulphur, by the strongly acid solution that must be employed.

The method described herewith gives excellent results with all ores and alloys containing antimony, and it is much more accurate than any of the gravimetric methods, while it possesses the further advantage of being almost as speedy as the dry assay. This process is similar to the iodide method, the principal exception being that a standard solution of stannous chloride is substituted for the thiosulphate solution commonly employed in the titration. The means of getting the antimony into solution also differs from those usually adopted, hydrochloric acid (with the addition of tartaric acid) being much superior to hydrochloric acid plus nitric acid or potassium chlorate for this purpose, as not only is it more certain and expeditious than the latter, but it is also suitable for any ore of antimony, the presence of tartaric acid ensuring the complete solution of all compounds, whether sulphide, oxide, or oxychloride. Tartaric acid does not interfere, however, with the subsequent precipitation by sulphuretted hydrogen.

The determination of antimony by the iodide method is based upon the estimation of the iodine liberated when potassium iodide is added to a solution of antimonic chloride. It is essential for success that all of the antimony shall be present as antimonic chloride ($SbCl_5$), while free chlorine must be completely absent from the solution, which must be kept strongly acid.

The assay is conducted as follows: From 0.5 to 2 grams of the finely crushed ore, which should pass a 100-mesh screen, is dissolved in strong hydrochloric acid, with the addition of a few crystals of tartaric acid, heat being applied until no further action takes place. When the antimony is completely in solution, the assay is diluted to about 300 c.c. and a brisk current of sulphurretted hydrogen is passed through the liquor till it is thoroughly saturated. After the antimony has all been precipitated, the sulphide and insoluble residue are filtered off and washed two or three times with water containing sulphuretted hydrogen. The filtrate, which contains the iron, etc. present in the ore, may be discarded. The filtering and washing should be done as quickly as possible since the antimony sulphide is liable to decompose and again go into solution on exposure to the air.

The bottom is now knocked out of the filter, and the precipitate washed into a flask. About 100 c.c. strong hydrochloric acid, with the addition of a sufficient quantity of potassium chlorate to completely convert the antimonious chloride to antimonic chloride, is added to the assay, which is then boiled until the sulphide has dissolved. After free chlorine has been entirely eliminated the assay is allowed to cool, and when cold about 5 grams of potassium iodide is added to it. Iodine is liberated by the antimonic chloride in accordance with the reaction:

$$SbCl_5 + 2KI = SbCl_3 + 2KCl + I_2.$$

The assay will now assume a brown color, due to the iodine liberated, but should contain no precipitate, as antimonious chloride ($SbCl_3$) is soluble in strongly acid solutions. The solution is then immediately titrated with a standard solution of stannous chloride, and, during titration, the assay must be thoroughly shaken. The color is gradually discharged as the stannous chloride is run in, and when it has become pale a few cubic centimetres of freshly prepared starch solution are added, and the assay is well shaken. A deep blue color is at once produced, and the titration is continued until this is discharged. The end reaction is very sharp, even sharper than in the iodic method of determining copper, and, consequently, the titration should be done cautiously as this stage is approached. When the reaction is complete the assay should be quite clear except for the insoluble residue. The blue color generally reappears on standing a minute, but this is due to secondary decomposition, and may be disregarded; it is discharged by the addition of a single drop of the stannous chloride solution. The stannous chloride reacts with free iodine in the presence of hydrochloric acid thus:

$$SnCl_2 + I_2 + 2HCl = SuCl_4 + 2HI.$$

The volume of the standard solution of stannous chloride required for titration multiplied by the standard of same equals the weight of antimony in the sample taken for assay. Therefore the percentage of antimony present is found by the following calculation:

$$\frac{\text{Standard} \times \text{the c.c. stannous chloride solution required} \times 100}{\text{Weight of ore taken for assay.}} = \text{per cent of antimony.}$$

Since copper and arsenic also liberate iodine, and as bismuth iodide exactly resembles free iodine in color and would therefore interfere colorimetrically with the titration, these metals, if present, must be removed from the solution. The copper and bismuth may be separated by washing the combined sulphides on the filter with a solution of sodium sulphide, in which antimony sulphide is soluble (it is re-precipitated on acidifying with hydrochloric acid); the arsenic by boiling the sulphides of arsenic and antimony with strong hydrochloric acid, which does not dissolve arsenic trisulphide. Tin does not interfere, as, under the conditions, it would be present in the stannic condition only.

The solutions required for the assay are:

1. Standard solution of stannous chloride; this is prepared by dissolving 10 grams of stannous chloride in hydrochloric acid and diluting to a litre. This solution should be kept under paraffin as it oxidizes very readily.

2. Standard solution of antimonic chloride for standardizing; this is used to standardize the stannous chloride solution, and it is prepared by dissolving 0.2 gram of pure antimony in strong hydrochloric acid and potassium chlorate. This must be done in the cold, as the metal is almost insoluble in hot hydrochloric acid and potassium chlorate. When the antimony has dissolved, the solution is boiled till free chlorine has been driven off, allowed to cool, potassium iodide added, and titrated with stannous chloride in the same way as described for the assay. The antimony equivalent of the stannous chloride solution is found by the calculation: 0.2 gram antimony divided by the c. c. stannous chloride solution required for titration is equal to the amount of antimony (in grams) represented by each c. c. of the standard stannous chloride solution.

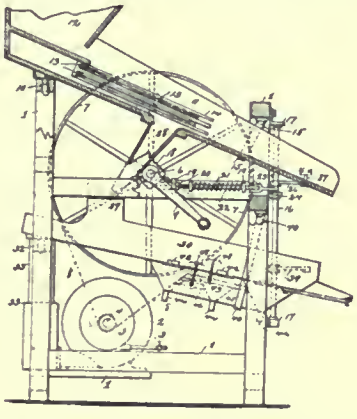
3. Starch solution; this is prepared as for the iodide method for copper. The solution must be fresh and entirely free from floating particles.

THE Bay Counties Power Co. is bringing down their electric lines from Colgate to Oakland across the Carquinez straits by the longest span in the world. The two steel supporting towers are 4,227 ft. apart, and carry four wires of $\frac{7}{8}$ in. stranded steel cable, three of them being used for current transmission, while the fourth is kept for a spare. The pull on each cable at its anchorage is about 12 tons, and necessitated the design of special insulators to withstand this strain and give insulation at the same time.

MINING AND METALLURGICAL PATENTS.

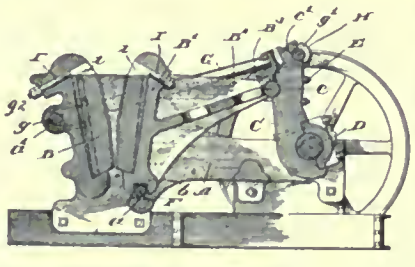
Specially Reported for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR SEPARATING METALS FROM ORES.—No. 839,329; William Snee, West Elizabeth, Pa., assignor to John A. Snee, West Elizabeth, Pennsylvania.



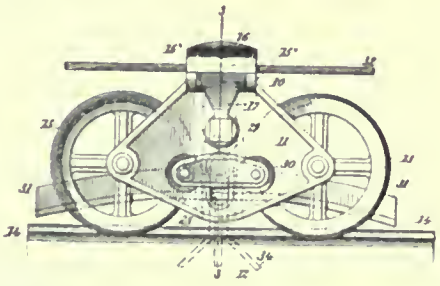
In a separating apparatus such as described, the chute 30, having an oscillating lateral movement, transverse openings formed in the bottom of said chute, slide-valves operating to regulate the area of said openings, in combination with an air-blast directed over and at right angles with the openings, as and for the purpose described.

CRUSHING-MACHINE.—No. 839,103; Morton G. Bunnell, Chicago, Ill., assignor to Western Wheeled Scraper Co., Aurora, Illinois.



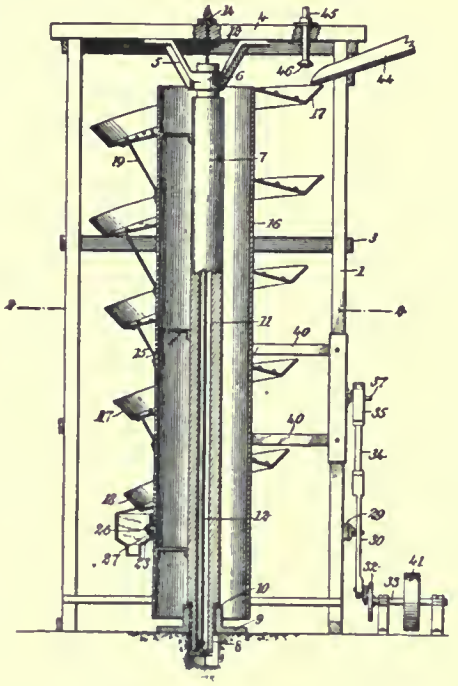
A jaw-crusher comprising a bed or body, a hopper formed in part by a movable jaw, a supporting-roll interposed between the bed or frame and the body of the said jaw, a pitman for actuating said jaw and connected with the latter at a point practically or substantially on a level with top of the jaw, and thereby above or substantially above the lines of resistance, and a swinging yoke having one end tied to the pitman and the other end tied to said bed or frame, said yoke thereby adapted to sustain both tensile and endwise compressive strains during the operation of the crusher, and a roll, yoke, and pitman combining to give the jaw a combined oscillatory and bodily forward-and-back movement, the said roll constituting an antifriction supporting bearing upon and about which the movable jaw is tilted or oscillated by the said pit man.

CLUTCH FOR AERIAL ROPEWAYS.—No. 840,109; Giulio Ceretti, Milan, Italy.



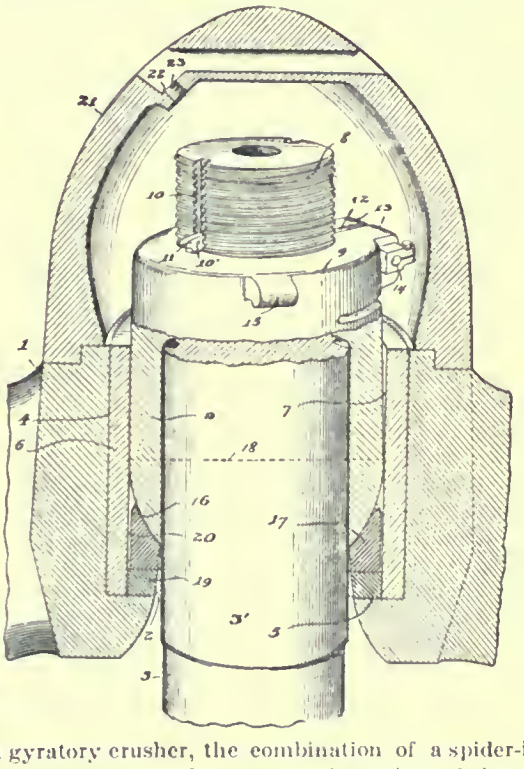
The combination with a rail or other support, of a coupling comprising a carrier-truck, adapted to ride thereon, clutch mechanism on said carrier-truck comprising a fixed jaw, and a movable jaw adapted to engage a traveling cable, a reciprocating link connected to said movable jaw, and a vertically movable member, adapted to sustain the load conveyed, co-operating with said reciprocating link to actuate said movable jaw, substantially as specified.

ORE-SEPARATOR.—No. 840,354; Matthew R. Lyle, Oakland, California.



A separator having a chute diminishing in sectional area toward one extremity thereof, and means for agitating said chute, said chute presenting an overhanging edge throughout the length thereof, whereby the waste material is constantly ejected from said separator as it progresses downwardly.

GYRATORY CRUSHER.—No. 839,891; Jay B. Rhodes, Chicago, Ill., assignor to Austin Manufacturing Company, Chicago, Ill., a corporation of Illinois.



In a gyratory crusher, the combination of a spider-head bored to accommodate the upper end portion of the main gyratory shaft, a supporting ledge or shoulder upon the interior of said spider-head, a main gyratory shaft, a wearing-sleeve mounted upon the upper end portion of said main shaft, and extending both above and below the centre of gyration of said shaft, the lower end of said sleeve being formed with a convex upper surface projected from a centre substantially coincident with the centre of gyration and supported by the said ledge or shoulder of the spider-head.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

It is without doubt the rule that the rights of a subsisting senior locator of mineral land are paramount to those of the owner of a junior location, so far as the latter conflicts with such prior location. It is equally plain that the power conferred by the United States statute, to re-locate a forfeited mining claim, does not place the locator in privity of title with the owner of the prior or forfeited location. In a conflict between locators the Court put the question and decided the principle thus: "The question then is, where there was a conflict of boundaries between a senior and junior location, and the senior location had been forfeited, has the person who made the re-location of such forfeited claim the right, in adverse proceedings, to assail the title of the junior locator in respect to the conflict area which had previously existed between that location and the abandoned claim? To say that the re-locator had such right involves, necessarily, deciding that as to the area in conflict between the junior and senior locators, the junior could acquire no present or eventful right whatever, and that on the abandonment or forfeiture of the senior claim, the area in conflict became, without qualification, a part of the public domain." After quoting Section 2,326 of the Revised Statutes of the United States, the Court added: "This section plainly recognizes that one who, pursuant to other provisions of the revised statutes, has initiated a right to a mining claim, has recorded his location notice, and performed the other acts made necessary to entitle to a patent, and who makes application for the patent, publishing the statutory notice, will be entitled to a patent for the land embraced in the location notice, unless adverse rights are set up in the mode provided in the section. Thus clearly providing that if there be a senior locator possessed of paramount rights in the mineral lands for which a patent is sought, he may abandon such rights and cause them in effect to inure to the benefit of the applicant for a patent by failure to adverse or after adversing, by failure to prosecute such adverse." The conclusion of the Court was that the area conflict between the two locators did not upon the forfeiture of the senior locator become unoccupied mineral lands in such manner as to enable a re-locator of such forfeited location to adverse successfully the application for a patent by the junior locator.

Lavagnino *v.* Uhlig, 25 Sup. Ct. 716.

It is essential that at the date of a location the ground located should be a part of the public domain. And it has been decided that an amended re-location made after the land had reverted to the public domain could not cure any defect in the original location from the fact that the land was not then subject to entry, where the rights of other persons had intervened. Thus it was said that one end of a lode-mining claim, which was separated from the rest of the claim by a patented placer claim, did not revert to and become a part of the public domain and as such subject it to re-location, until the claimant elected to retain and patent the north end of the claim, although such election was not made within the 60 days given for that purpose by the Land Department in refusing a patent for the entire claim for the reason that it was divided by the placer claim, but was deferred until after the unsuccessful termination in the Land Department of a contest with the placer claimant, begun after the decision refusing the patent. And it was further decided that the election to retain the north end of such lode-mining claim took effect instantly as an abandonment of the south end although the entry as to such tract had not then been formally canceled.

Brown *v.* Gurney, 26 Sup. Ct. 509.

The rule is established by the courts generally that the interest in a mining claim, prior to the payment of any money for the granting of a patent for the land, is nothing more than a right to the exclusive possession of the land based on conditions subsequent, a failure to fulfill which forfeits the locator's interest in the land.

Helena Gold &c. Co. *v.* Baggaley, (Mont.) 87 Pac. 455.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The mineral sent by A. H. F., of Dillon, Mont., is massive brown Garnet.

The brownish gray octahedrons from the Silver Top mine are Cerargyrite, or Hornsilver.

The mineral from Copperopolis, Cal., marked H. W. R., is commonly called Mountain Leather, a variety of the amphibole asbestos.

The yellow crystals from the Metalline mining district, Stevens county, Wash., marked J. H. H., are Wulfenite, the molybdate of lead.

Specimens from J. C. H., of Auburn, Cal., are No. 1, altered Gneiss; No. 2, Quartz; No. 3, Schist; No. 4, lignitic Coal; No. 5, Calc tufa.

The scaly material sent by J. B. G., of Dragoon, Ariz., is Mica and not molybdenite. The latter is darker lead-gray and metallic, resembling graphite.

The specimens from Villa Grove, Colo., marked F. S. C., are: No. 1 and 2, Quartzite containing pyrite crystals; No. 3 and 4, Chalcopyrite with some zinc-blende.

The stout prismatic crystals from the Desert Queen mine, of Tonopah, are Stephanite and the flat tubular ores are probably Polybasite. Stephanite and polybasite are difficult to distinguish apart.

THE MANAGEMENT of the North Star mines, at Grass Valley, in Nevada county, California, announced, on Christmas day, its intention to grant the eight-hour day to its employees. Mr. A. D. Foote, the manager, said: "On the first of the month the company has agreed to give the men the eight-hour working day. The men will start to get ready to go down at 6:45 in the morning and be ready for work at 7:15. They will work till 12, take half an hour for luncheon and then work until 3:45, when they will start to come on top. The night shift will all be down at 4:15, work till 9 and then take half an hour off for luncheon. It will quit work at 12:45. After the last man is out, a separate blasting force will attend to this part of the work and save you from eating a lot of powder smoke and dust. This, I think, will make things easier for you, add considerably to your lives, and at the same time enable us to mine as cheaply as now."

THE FOUNDATION CO., of New York, is engaged in sinking a shaft at the Syracuse, a Pickands-Mather company. The method used is entirely new on the Mesabi range, and is similar to that adopted in sinking caissons for buildings in the large cities. The work of concreting the walls of the old shaft at the Syracuse down as far as the water-level has been completed. A roof of concrete is now being constructed across the shaft at the water-level. Through this roof is set a section of air-tight circular steel shafting through which compressed air is admitted to the workings below the roof and through which the workmen will descend and ascend to and from their work. The steel shafting will be built in sections to the top of the shaft and capped with the section that contains the trap-doors through which the men enter and leave the shaft.

Geological Exploration in Alaska.

During the past season, the United States Geological Survey had numerous parties at work in Alaska. Their investigations covered a wide area, including the Glacier Bay region and Chichagof Island in southeastern Alaska, the Yakutat Bay region, the Controller Bay region, the Sushitna Basin, the Fairbanks and Kantishna placer districts in the Yukon-Tanana region, the valleys of the Yukon and the Porcupine and Seward Peninsula.

In the latter part of June, Mr. Alfred H. Brooks, chief of the Division of Mineral Resources of Alaska, joined Mr. E. M. Kindle at Eagle on the Yukon and remained with him three weeks, studying the stratigraphy of the section exposed along the Yukon River between Eagle and Circle. At Circle they separated, Mr. Kindle continuing down the river to the Porcupine and Mr. Brooks going overland to Fairbanks. This journey of about 200 miles, made on foot and alone, was accomplished in about two weeks. Subsistence and lodging were obtained at the different road-houses, as Alaskan taverns are called, or when these were lacking, at the prospectors' cabins and camps.

During the course of the journey a hasty survey of the Birch Creek placers was made. These placers, which have been continuous producers, are still being exploited. As they lie between 30 and 50 miles from navigable waters on the Yukon, the cost of all supplies in the district is enormous. Wages are from $6 to $7 per day, with board, which is counted as worth $3 per day. Winter freight rates are from 6 to 8 cents per pound, while the cost of summer transportation from Circle to the diggings is from 25 to 30 cents per pound. With such excessive costs, it stands to reason that only the richest placers can be exploited. In spite of these adverse conditions, the Birch Creek district has produced from $200,000 to $300,000 worth of gold annually for a number of years. Could the cost of operating be reduced, many creeks might be worked which are now untouched. Plans have been formulated for the use of dredges in this district and a large group of claims have been secured on Eagle creek, which are to be worked by dredging methods. The unfrozen condition of the gravels on this creek is favorable to dredging methods. Other placers of the district are also under investigation by capitalists, with a view of determining the possibility of their exploitation by dredges.

Mr. Brooks reached Fairbanks in the latter part of July. This district, the largest placer gold producer in the Yukon Basin, suffered seriously because of a drought which lasted until the end of July. Nevertheless, its output in 1906 probably exceeded that of 1905, which was about $6,000,000.

At Fairbanks Mr. Brooks joined a party under charge of Mr. J. L. McPherson, engineer of the Alaska Road Commission. The party of five men and seven horses made its way westward from Fairbanks for the purpose of exploring a route for a trail to Nome. At present, winter communication between Fairbanks and Nome is by Tanana and Yukon rivers, but it is proposed to establish a more direct route which will probably shorten the distance 200 miles. This party reached the Yukon at the Rapids about the first of September. While en route Mr. Brooks was able to visit some of the more important placer-bearing creeks of the Rampart district. This district, too, suffers from lack of means of communication, but a road, now being built south from Rampart, and another, completed to Glenn creek from the Tanana, will do much toward cheapening the cost of mining operations.

Mr. Brooks reached Nome early in September, and there joined Messrs. F. H. Moffit and P. S. Smith, of the Survey, who were engaged in mapping in detail the areal geology of the Nome and Grand Central quadrangles. The geology of this field is exceedingly intricate, and very much time has been given to the collection of data in regard to the occurrence of gold in the placers. Mr. Brooks found that Nome had been exceedingly prosperous during 1906, in spite of the long drought which so reduced the stream flows in many parts of the Seward Peninsula as to almost prevent any mining on the creeks. Fortunately, the discovery of rich placers along an ancient beach lying about five miles inland, and running parallel to the present shore line, led to great activity, and, therefore, in spite of the adverse season, the gold output of the Peninsula in 1906 was over $7,000,000, and nearly $2,000,000 more than in 1905.

The value of geological investigation to the mining interests is well illustrated by the discovery of these ancient beach-placers. As early as 1899 and during the first gold excitement at Nome, the geologists of the Survey published a statement predicting the discovery of ancient shore lines and presented evidence that these would probably be found to carry commercial placers. These statements were borne out by later investigations, and it remained only for the miners to bring the final proof that the theories were correct.

Later, Mr. Brooks joined Mr. F. F. Henshaw, who, under the general supervision of Mr. John C. Hoyt, was engaged in studying the water resources of the Nome region. It is every year becoming more and more evident that the chief problem to the Nome placer miner is how to obtain an adequate supply of water. Stream gauging is, therefore, of the greatest possible value to the mining interests.

The latter half of September was devoted by Mr. Brooks to a reconnaissance of the more important placers of the Kugerok district. This placer field, which lies in the central part of the Seward Peninsula, has been exploited ever since 1900. Lack of capital has, however, up to the last two years, prevented the proper development of the placers, especially as the district has been very inaccessible. Recently, however, a railway has been built from Nome to Lane's Landing, at the southern margin of the district, and ditch building has been going on with feverish activity. About 40 miles of ditch have been completed, and other projects are under way. While some of these enterprises are hardly to be commended, yet there can be no doubt that mining operations will now increase with great rapidity.

ARTICLES ALLOWED IN INTERIOR ALASKA MAIL.—Articles allowed in the winter mail carried overland and intended for interior Alaska and Yukon points are letters, post cards, singly-wrapped newspapers, and periodicals from the office of the publication addressed to public libraries, newspaper publishers, and to individual subscribers, transient newspapers, and third class matter of all kinds, excepting books, trade catalogues, circulars, and patterns and samples of merchandise.

A letter is defined for post-office purposes as "any article of correspondence prepaid at letter rates and contained in an envelope, however large, which might be presumably used for enclosing a letter, and such documents as are from time to time sent under the same cover as letters." The articles excluded are periodicals sent to dealers for purposes of trade, in bulk or otherwise, sample copies, catalogues, books, circulars, samples of merchandise, and fourth class matter.

CAPITAL is result. Labor is effort. Capital is a product of previous effort, while labor is present effort.

A Powder Test.

The accompanying illustrations serve, to a certain extent, to show what a trifle over one pound of Aspco, the new safety explosive, will accomplish. In the upper photograph it will be seen that a drill-hole has been made in a boulder approximately 12 ft. in diameter, and in which but five

Tamping the Hole.

eight-inch sticks or cartridges of $\frac{7}{8}$ in. diam. have been loaded. It was intended to use nine or ten cartridges, but, as the bottom one became choked or blocked, it was possible only to insert five, which weighed slightly over one pound. There was some doubt as to the results on account of this

Result of the Blast.

light charge, but a glance at the lower photograph (after the explosion) demonstrates the wonderful energy and disruptive force of this new powder. The demonstration at which these photographs were taken was given at Los Gatos, Cal., on September 12, 1906, in the presence of a number of mining experts, and was satisfactory in every way. We are informed that this new explosive is guaranteed to meet all claims made by the manufacturers, The American Safety Powder Co., whose works are situated at San Jose, Cal. The sales manager of Aspco is George W. Myers, P. O. Box 135, Berkeley, California.

The Pelton Water Wheel Company.

The first modern machine-shop to be erected in San Francisco since the fire of last April, is that of the Pelton Water-Wheel Co., which is in the block bounded by Harrison, Alabama, and 19th St. This is now in complete running order. Although the company was completely burned out in its former establishment on Main St., it was fortunate in having, prior to the disaster, planned and contracted for its new works, and although the plant was erected under the emergency condiditions immediately following the fire, it is not a collection of temporary structures by any means, but of most substantial construction throughout. The design and equipment is the result of careful study, and for its capacity represents one of the best plants in the country today, being intended as the permanent home of this enterprising concern.

The main machine shop is 124 ft. 6. in. wide by 180 ft. long, and is devoted exclusively to machine-work on water-wheels and hydraulic accessories. The building consists of two bays, each 62 ft. 3 in. wide and 40 ft. high to the bottom of the roof-trusses. The columns of the main row consist of a 16 by 16 in., with a 12-in. timber on each side—spaced 20 ft. centres, each supporting one end of the roof-trusses. The 12 by 12 on each side of the 16 by 16 in. timbers are bolted through and form a double row of crane-track supports for one side of each bay. The crane-tracks of the main bay are placed 34 ft. above the floor, and the crane has the entire run of 180 ft., reaching within three feet of each side wall and five feet of each end wall, thus covering a floor area of about 10,000 sq. ft., and reaching all of the motor-driven tables. The second machine bay is equipped with a crane-track 20 ft. above the floor and running the entire length of the building. The main crane-track is on 24-in. I-beams and the secondary crane on 15-in. I-beams—all supported on the above mentioned 12 by 12 posts with 20 ft. centres. The second bay is arranged with the crane lower than in the main bay, admitting of a second floor being placed over the crane, thus affording space for the pattern shop, drafting room, and office. Separated from the main building by a 20-ft. driveway is a two-story pattern annex 62 ft. 3 in. wide by 75 ft. long, being an exact continuation of the second bay of the main shop, so that the main building may be continued to a depth of 275 ft. when desired. This building is fitted with an elevator for the convenient handling of large patterns to the second story. In the pattern annex there is a hydraulic laboratory of particular interest, now being fitted up with a special apparatus for the investigation of bucket and nozzle curvatures, provision being made for the constant gravity and pump pressures, prony brakes, chronographs, mercury gauges, electrical recording apparatus, etc. In this building is also placed, temporarily, a special bucket-milling apparatus for machining with mathematical accuracy, buckets for the Pelton water-wheels.

Commercial Paragraphs.

THE MINNEAPOLIS STEEL & MACHINERY CO. has recently opened an office at 1300 W. 11th St., Kansas City, Mo., under the management of Louis Bendit, for the sale of their Munzel gas engine and suction gas producer.

HENRY R. TOWNE, president of the Yale & Towne Mfg. Co., Stamford, Conn., at a meeting of its superintendents and foremen held recently, made announcement of an increase of wages and piece rates of its 3,000 employees, making a grand total of $120,000. This action is voluntary on the part of the company and is intended to recognize the industrial conditions now prevailing.

THE POWER & MINING MACHINERY CO., of Cudahy (a suburb of Milwaukee), Wis., in conjunction with The Snow Steam Pump Works of Buffalo, N. Y., has opened a new sales office at 719 White Bdg., Buffalo, where will be handled the several types of gas-generating apparatus, such as the Loomis-Pettibone system, suction and pressure gas plants, built by the Power & Mining Machinery Co., and the Snow gas engines, built by The Snow Steam Pump Works.

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Editorial.

A GOOD DEAL of twaddle is being written about Mr. Simon Guggenheim, the new senator from Colorado. His resignation as a member of the executive committee of the American Smelting & Refining Company has no meaning, for he retains his financial interest in the company and as regards the management it is well known that Mr. Daniel Guggenheim is the dominating spirit at 71 Broadway. The new senator is an able business man and one of a large family of enterprising citizens, but his fitness as a legislator is a wholly unknown quantity. The method by which the election was secured indicates crude notions of civic duty, and it seems to us that in certain States, like Montana and Colorado, it would be better to put the senatorships up at auction; this would avoid the necessity for debauching the legislature and it would give the State another source of revenue.

THE dump at Stratton's Independence mine ought to go down in metallurgical history as a landmark, for it has been observed, tested, and tried by a succession of experts—Cassel, Hammond, Huntoon, Beatty, Doveton, Schroter, Merrill, and last, but far from least, Argall. A pile of 600,000 tons that will average $3.70 per ton represents a nice sum of money and if two-thirds of it can be turned into profit, as claimed, the famous old mine will add another $1,500,000 to the $5,000,000 that it has given to the shareholders. Just at present that famous dump promises to stimulate a battle of the processes, for vacuum-filters and filter-presses are pitted against each other, not to mention other modifications that may be thrown into the metallurgical show. Whatever the process, we hope the directors of the company may have the good fortune to get a maximum extraction at a minimum expenditure.

THE transfer of *The Argonaut* into the capable hands of Mr. Alfred Holman is an event in the journalism of the Pacific Coast that we are glad to record. Fifteen years ago Mr. Holman controlled the MINING AND SCIENTIFIC PRESS; more recently he has lived at Sacramento, where he edited and published *The Union* in such a manner as to enhance its value fourfold. Among Western periodicals *The Argonaut* won prominence long ago when edited by Frank Pixley, a clever eccentric who ended his journalistic career most ignominiously. Since then Mr. Jerome Hart has conducted the paper, without particular effect. Under the new direction it is likely to exercise an influence equal to its past reputation for trenchant literature, because Mr. Holman is a man of both character and ability; of the latter there is plenty on the papers of San Francisco, of the former there is precious little. That is why their attacks on municipal corruption are so ineffective and their descriptions of bestialities so copious.

Therefore we are glad to know that henceforth *The Argonaut* will give voice to the better thought of this community.

THE ARREST of Dr. R. C. Flower in Mexico recalls his successful swindling in New York a few years ago. He operated several mines in Chihuahua, all of which were absolute failures, and at the time when he became a fugitive from justice in 1903, he had just organized a Pan-American $15,000,000 corporation. His operations were stopped finally by suit brought by a widow, who had lost money in one of his ventures. There are many like him out of jail today, and the game he played is being worked enthusiastically by scores of similar swindlers all over the country.

IN REVIEWING the speculative spirit of 1906, we referred to the fact that Boston had escaped any spasm of excitement. This was only just true, for in the first week of 1907 there was a copper boom of a most lively character that gave the brokers of Boston the busiest time they have had for years. On January 4, 244,531 shares were sold on the Exchange, as compared to an average day of 50,000. Lawson's advertising campaign caused Trinity to be the basis for big dealings, 10,000 more shares being sold in ten days than there are shares in the company. All the big mines of Michigan, such as Calumet & Hecla, Oseeola, and Copper Range, scored a rapid rise and the disposition seemed to be to favor the properties so long familiar to the Boston public. A 25-cent price for copper explains much of the speculation, for the metal has appreciated so much as to ensure big profits to well-managed mines. The Lake Superior mines are among the best managed in the world and people who speculate in them are sure of a run for their money, but we hope that the Boston boom will keep within the limits of the safe and sane.

The Geological Survey.

The United States Geological Survey has recently received severe criticism in regard to its relations with educational institutions and State bureaus of geology. One of the first fruits of an aroused public opinion has been a prompt desire on the part of the Director, Mr. Charles D. Walcott, to meet the situation squarely. At his call, a conference of State Geologists has just been held at New York in connection with the annual meeting of the Geological Society. The difficulties of the situation are said to have been frankly discussed and methods were outlined for an exchange of plans and notes between the different surveys, State and National; it was also arranged to hold further conferences at regular intervals. The meeting made it clear that more personal contact is advisable between the officers of the Federal and the State Surveys, and it was impressed upon the Washington people that there is a real feeling of dissatisfaction that must be respected. A good understanding was reached, the need of strong State surveys was emphasized, and the co-operation of the chief of the Federal Survey was practically assured. This is news that it is a pleasure to chronicle.

The Survey seems destined for better days, it is shedding some of those departments that were devoted to wood, water, and arithmetic — appendages and encumbrances detrimental to progress. The Forestry work was turned over to the Agricultural Department by action of the Congress about eighteen months ago, and in July last year the Reclamation Service was severed from the Geological Survey, except that Mr. Walcott continued to act as director of both, by order of the Secretary of the Interior. It is no secret that Mr. Walcott really wants to be relieved of his responsibility as head of the Reclamation Service, and the latter will become a totally separate bureau at an early date. The division of Hydrography has had its name changed to Water Resources. It includes a broad study of an important subject, and the geological knowledge required of the men who conduct the investigation is held to bring it within the proper scope of the Geological Survey. It is a small affair as compared with the other activities of the Survey.

There remains the Statistical branch, which, in our opinion, is too prominent. To turn geologists of first-rate ability into amateur statisticians, and to label compilers of statistics as geologists, appears to us to be a blunder. Of course, a man familiar with the mining geology of California, for example, will collect mineral statistics and information concerning the distribution of the metals with more intelligence than a clerk or accountant, but it looks like waste of a rare kind of ability to set certain geologists, whom we need not name, to such a task. We hope the Survey will be able to subordinate this part of its work, so that the actual investigations of ore occurrence may not lose the services of some of the best men. The compilation of statistics is at the best an unscientific application of arithmetic, and we would like to see it kept in a subordinate position.

On the whole, as a friendly critic of the Survey, we take pleasure in acknowledging the tendency to shed the unessential, and to concentrate work on the main purpose for which it was organized by Clarence King. It is only fair to give the Director credit for great administrative ability and to recognize the fact that, for this reason, he has had thrust upon him, by the President and by the Congress, a multiplicity of duties, which have interfered with his work as a chief of geology. By reason of the usual ignorance of members of the Congress concerning the work of the Survey, it becomes necessary for the Director, and certain of his assistants, to make some sort of presentation of the facts relating to the conduct of their work. For this reason we hope that mining engineers and other professional men, most of whom are keenly interested in the welfare and continued usefulness of the Geological Survey, will take a little trouble to enlighten their representatives at Washington.

Since the above was written we have learned that Mr. Walcott has been chosen Secretary of the Smithsonian Institution, a post of much honor and importance in the scientific world. We await the name of his successor with keen interest, for the usefulness of the Geological Survey must depend largely upon the ability and policy of its chief.

By the Way.

In a recent issue of *The Evening Post*, of New York, there appeared the following discussion on the persistence of our present prosperity:

In the comprehensive review of the financial situation from a dozen great money markets of the world, the noteworthy fact was the unanimity with which assertion that prosperity is today unprecedented was coupled with a note of warning or misgiving. Various reasons, most of them vague enough, were assigned for this state of mind; in general, the dominant idea appeared to be that the trade activity incident to existing prosperity had reached such a pitch that neither capital or transportation could keep pace with it. One might trace, in these suggestions of doubt about the future, much the same feeling as inspired Secretary Shaw to advise prayers against any greater prosperity, or Mr. James J. Hill to declare that the railway situation of today threatens commercial paralysis. Both of these intimations were based on a state of things which nothing but extraordinary prosperity could have created.

The *Journal of Commerce* yesterday published the views of numerous economists and practical financiers on the question whether we are approaching a financial crisis. With prosperity admittedly at high notch, one might imagine such an inquiry to partake of the absurd; but the experts to whom it was put take it seriously enough, and do not agree in their answers. Professor Sumner of Yale asserts that in the economic outlook he "cannot see the slightest cause for apprehension." "In times of great prosperity," he proceeds, "speculation becomes over-confident and rash. I see no signs of any such error now." Professor Laughlin of Chicago University is not so sure. His comment is:

"In conclusion, there seems to be no immediate evidences of a crisis in the very near future. But no reform of our currency, no combination of large financial interests, will prevent the inevitable over-expansion in due course of time, which must finally be followed by liquidation. Even now the materials for overconfidence may be gathering. The speculation in real estate, which is usually the latest phenomenon of a high range of prices, is already more or less apparent."

Professor Clark of Columbia, remarking that if the familiar periodicity in panics is observed again, 1913 would be the year for the next one, concludes his review by predicting that "recklessness now—general infection with the virus of a speculative fever—will cause the crisis to arrive at its scheduled date and with all needed severity."

So much for the economic students; the practical men display similar variation of opinion, with, however, more unanimity in doubt as to the future. The most optimistic view expressed is that signs "point toward continuance of the prosperous times for at least another year." Mr. Stuyvesant Fish goes so far as to declare that "in point of time a great industrial crisis is due, and there are many indications of its being imminent"—among these indications being the dearness of money because of high prices, waste of capital, and decreased efficiency of labor; absorption in Wall Street speculation of an undue proportion of the country's capital, and growing distrust by the people of methods prevalent in the investment markets. Taken as a whole, the statements plainly show that all classes of the community are pervaded with the idea that a change of some sort, in the industrial and financial outlook, may not be very distant.

What is to be said of this? First, no doubt, that experienced men accept it as an axiom of trade that profits and volume of business never expand indefinitely, and that a check of some sort is apt to be sustained when it is manifest, as it is today, that the 'boom' has outstripped existing facilities of production, labor, transportation, and capital. To that extent, the judgment of practically all trained observers in the business world would doubtless be in unison. It is when the nature and severity of the possible reaction are considered that agreement ceases. 'Trade reaction' and 'industrial crisis' are by no means synonymous terms. We passed through an unmistakable trade reaction during the second half of 1903; the surest sign being that in the period monthly iron production was cut down one-half, in spite of which reduction unsold supplies increased nearly half a million tons. Yet this was scarcely a financial or economic crisis; nor could that term be fairly applied to the similar contraction of business during 1900. In neither episode was the great forward movement, characteristic of the first half of the 'cycle of prosperity,' seriously interrupted. Such a crashing-down of the credit structure as occurred in 1893, for instance, is a very different matter.

Reactions such as those of 1903 and 1900 will be frequently encountered; it is not at all improbable that the country has something of the sort not very far ahead. It would not be so easy to discern sure indications of a severe industrial crisis. More people than Mr. Fish have been made uneasy by the abnormal state of the past year's money market; and the assertion has been ventured, by both home and foreign bankers, that these phenomena, taken by themselves, closely resemble those which preceded the troubles of 1873 and 1890. But it may be alleged, on the other hand, that evidence of actual impairment or abuse of credit, as distinguished from mere overstrain on capital, was really the fundamental danger sign of those two years. It appeared as fully in commercial as in financial affairs; an entire community had not only been indulging in extravagance, but was involved in debt to an exceptional degree. It may be questioned whether the present situation provides a parallel; it certainly does not, so far as regards the absolute insecurity of the basis on which the 'boom' preceding each of those periods had at the end been exploited. For the rest, Professor Clark is probably wise in holding to the 'twenty-year interval' as a means of taking our present economic reckoning. If tradition is followed in this generation, we still have a half-a-dozen years to wait before the first-class crisis.

AMERICA is not yet a democratic country; it is moving along the road to democracy. Our fathers realized that they were entering on an experiment, and they were cautious. They adopted the political methods of the mother country modified to suit the new conditions. They dispensed with certain feudal inheritances, but they did not straightway establish a pure democracy. They did not trust the people to choose their President, but only to elect a body of wise men to choose one for them; nor to determine their national policies, but only to elect representatives to determine those policies for them. The nominations for the more important offices were made by their selected wise men; the votes which elected them were cast by a limited electorate.

Gradually the self-imposed shackles have been cast off. The suffrage has become approximately universal; the newly arrived immigrant had been given a share in the government after a very brief apprenticeship; the policies of the Nation are being determined by the people in public discussions, and the Congress is becoming a collection of committees to frame these policies in appropriate legislation. Debates are transferred from the floor of the Congress to the open forum and the press. The nominations are made by the people in popular conventions. Politically, the country is passing from a representative republic to a pure democracy.—*The Outlook.*

Special Correspondence.

Joplin, Missouri.

Output Increasing.—Mining in Sheet Ground.—Several New Strikes. —A Coal Discovery.—New Tract Opened for Prospecting.

The highest settling price reported paid for zinc ore last week was $50.50 per ton for one carload from the Golden Glow mine, a new one on the Underwriters Land Co.'s land at Webb City. In Joplin, several carloads sold at $50 per ton. The highest price reported paid for lead ore was $87 per ton for at least one bin in Webb City and also one in Joplin.

Shipments.	Zinc ore, Lb.	Lead ore, Lb.	Combined value, $
Past week	11,088,790	1,356,730	310,688
Up to date	22,259,370	2,981,230	632,850
Same period last year	21,091,540	2,309,840	578,425
Increase	1,167,830	671,390	51,425

This increase if maintained will mean an addition of at least $1,400,000 for the year.

A few years ago the mining of the sheet ground, now so extensively engaged in, was unheard of and when a mining company or the prospectors got down to the lime rock or very hard flint, it was thought they were at the end of mining that particular piece of ground and it was usually abandoned. With Eastern capital and mining men came the idea of going deeper and opening up the runs of ore that seem to underlie this entire mining district and the outlook for the year 1907 is that there will be more extensive sheet-ground mining than there has been in all the past five years together. It has been conceded by those acquainted with sheet-ground mining that the size of the profit is correspondingly large with the size of the mill, and a majority of the mills being erected on new prospects are from 300 to 500-ton plants. The sheet-ground development is being made very fast from Oronogo in a southeasterly direction through Webb City, Carterville, Prosperity, Porto Rico, Duenweg, Diamond, and on toward Granby. There are a few similar properties working in the west part of Joplin, having recently been opened up.

T. E. Allen, of Webb City, has made several good strikes of ore on the Quinby land, near Diamond, a 12-ft. run of zinc ore having been encountered in one drill-hole. L. A. Hatcher, of Webb City, reports a rich strike on his lease on the Lyon land, near Porto Rico. The run of ore was encountered at a depth of 165 ft. and continued down to 180 ft. Mr. Hatcher will begin at once to sink a shaft and develop the ground. Thos. Hill, one of the best known mining men in the Webb City district, reports a rich strike in a hole that he has just completed on an 80-acre tract, about a mile and a half west of Neck City. Mr. Hill struck the ore at about the 200-ft. level and it continued down to a depth of 262 ft. It is the first hole put down on the 80 acres.

Some Webb City parties have opened up a coal mine at a depth of 25 ft. on the Milton farm, near Alba. They have a 25-ft. vein, according to the showing of the drill. They are sinking a shaft for the purpose of finding out whether they have a coal mine or have just encountered a pocket, which is more than likely, as coal has been found in that locality for several years, but never in paying quantities.——The Ideal Mining Co., composed of T. F. Coyne and A. D. Hatten, of Webb City, and several New York capitalists, closed a deal yesterday for the 240-acre tract of land belonging to the Carter heirs. The land is situated just south of the west portion of Joplin. Several years ago, when ore was selling around the $20 mark, there was some mining done on the land and one mine, the Colorado, was a big producer, but of late years nothing has been done on the land. It will be thrown open for prospecting again. The deal was made through the Lyon Investment Co., and it is reported the consideration was $500,000.

Butte, Montana.

The Lewisohns Secure More Property.— Snowstorm Dividend is Passed.— East Butte Strikes Rich Vein.— A New Copper District.— Barnes-King Re-organized.— Copper and Gold Ores in the Cable Mines.— Butte & Superior Organized.

It is announced that the Lewisohns are about to organize a new company for the purpose of taking in several groups of mines and claims in the Butte district, including the mineral ground of the Great Northern Railway Co., which was incorporated under the name of the South Butte Mining Co. The Lewisohns recently secured an option on this ground and they have been exploring it. The same people are developing and exploring several properties in the district, and have options on half a dozen others. The proposed new company will be capitalized for $2,500,000.—— The Butte-Montana Co. has started to sink the shaft of the Alex Scott mine. It is 700 ft. deep and will be sunk to the 1,200-ft. mark. The company has copper ore at the 700, and expects to have a big mine at the 1,200. It is intended also to sink the shaft on the Annie. The latter claim is situated in the northwestern part of the Butte district, near the Goldsmith mine; it has a shaft 200 ft. deep, and at that depth some shoots of good ore have been opened.

Butte stockholders of the Snowstorm mine have received notice from W. D. Greenough that the January dividend has been passed, but that $45,000 will be distributed in February. "I had fully expected to start monthly dividends on the 10th of January, but owing to a number of circumstances over which I have no control I have been disappointed," says Mr. Greenough. "We have not received a carload of coal in five weeks, and this has caused a closing of the mill. In the last month we have been able to dispose of only the usual quantity of ore sent to the smelters. This is due, to some extent, to repairs on furnaces and the congested condition of traffic. The Snowstorm mine is developed to the point at which it should own its own concentrating and smelting plant. The condition of this particular district looks favorable for the erection of a smelter the coming summer. The mine is in shape to yield 2,000 tons of ore per day, and the company should provide for this output. Until some extensive arrangement is made to take care of the immense tonnage the mine is capable of yielding, the company will not be able to pay the dividends it should. Our ore is used almost exclusively for converter lining, and the different smelters that use it do not take any more of it than they require for this purpose. Hence we are likely to have our output curtailed at any time. We will pay a dividend of $45,000 in February, and if conditions are not too unfavorable we will be able to continue this dividend monthly."

The Butte-Milwaukee Co. has received the machinery for the new surface plant on the Colonel Sellers claim. Boilers, air-compressor, and engine have been delivered. The shaft is about 35 ft. deep and good progress will henceforth be made in sinking. Grading for the railroad spur to the shaft has been finished and the line will be completed in a few days.——The Davis-Daly Co. has ordered a new air-compressor for the Colorado mine. It will have a capacity of 25 drills. Sinking on the Colorado has been resumed. The shaft is 650 ft. deep. At the Smokehouse shaft, cross-cutting from the 500-ft. station will be started shortly.——In a west drift on a vein in the north cross-cut from No. 1 shaft of the East

Butte Co., a fine body of copper glance has been opened. The vein itself is about 12 ft. wide, and eight feet of it is high-grade ore, a foot of it being copper glance. The remainder of the vein is concentrating ore. The company is now regularly making shipments of ore independent of the many lessees working in the properties.

The Farrell Mining Co. has begun cross-cutting from the 200-ft. level of the Alliance shaft, and expects to cut the vein within a distance of 50 ft. —— The shaft of the Butte Copper Co., on the Trifle claim, has reached a depth of 500 ft., but 500 ft. more will be added to it before any extensive cross-cutting will be done. One vein that apexes in the Trifle ground has been cut by the shaft, and another, dipping from the Anselmo ground, is expected to be encountered soon. This vein was cross-cut and drifted on at the 500-ft. level, and was found full of ore.

A new copper district is being developed south of Butte in Beaverhead county, about 50 miles northeast of Dillon.

Montana.

The Park Copper Co., owned by Butte men, has been developing a property there for several months, and at a depth of 80 ft. cut a 12-ft. vein of good copper and silver ore. A number of prospectors and several companies are operating in the district and exploring the ground.—— The Barnes-King mines have been turned over to the new company, the Barnes-King Development Co., and a new lot of men are in charge. R. B. Lamb, of Berkeley, Cal., long connected with the Daly interests, is at the mines as consulting engineer for the new company, and W. K. Brule, an experienced gold mine operator, is in charge of the property as superintendent. N. A. Miles, formerly an instructor at Harvard, and son of General Miles, is geologist for the Barnes-King. It is the intention of the new company to double the output of the mines, increase the capacity of the mill, and spend about $400,000 in improvements and development.

The Butte & London Co. is cutting a station at the 800-ft. mark of its shaft on the Greendale. A large pump will be installed, and as soon as it is in position sinking will be resumed.—— The Cable Consolidated Mining Co., which was surprised several months ago when its diamond-drill penetrated a big copper vein while boring for gold deposits, has shipped several carloads of copper ore, which gave an average assay of 1% copper and good values in gold. In addition to mining copper, the company is operating a 20-stamp mill on its gold ore. The copper ore is shipped to the Washoe smelter at Anaconda. Some of the ore assayed as high as 11% copper.—— The shaft of the Colusa-Leonard Extension Co. penetrated bedrock at 220 ft. The bedrock is of greatly varying depth in that part of the district. The Colusa-Leonard found it at a depth of 225 ft., while in the Sinbad mine, 600 ft. north of the Colusa-Leonard, it was not found until the shaft had reached a depth of 417 ft. The Pittsburgh & Montana Co. struck it at 623 ft., its shaft being a short distance south of the Colusa-Leonard.

The Butte & Superior Copper Co. has completed its organization, and has elected A. B. Wolvin, of Duluth, president. Capt. Wolvin is a large shipowner, and has large iron mine interests in Michigan. He is also a director of the United States Steel Co. The Butte & Superior now owns the Blackrock, Niagara, Raymond, Constitution, Jersey Blue, and Four Johns mines, and the fractions known as the Silver Nob, and Duluth. In addition to these it has acquired fractional interests in several other claims, and is negotiating for others. The main working shaft being sunk on the Blackrock has reached a depth of 560 ft., and it will be put to the 800-ft. point before any cross-cutting is done. The company expects to get into the vein at that depth by the first of May, upon which date the stock is to be issued to subscribers.

London.

Retrospect of the Market.—Kaffirs Dull.—Copper Strong.—Cornish Tin Mines.—New Companies.—Scarcity of Labor.—Purchase of Interest in Dues.

The review of mining quotations during the past year reveals, in the case of Kaffirs, the finished work of the noisy demagogs and fussy doctrinaires who have dominated the political situation since the advent of the present Government to power. The "rascally" stockholders who put their money in South Africa have reaped chaff where they thought to gather in the golden grain. The crop has been abundant but it has fallen through their hands. The Rhodesian section has shared a similar fate, with the solitary exception of Tanganyikas, which about held its ground, owing to specially strong inside support. Speculators who turned to West Africans found little consolation, as in that department also influences, although of a different nature, found in climatic conditions and the delay in bringing the gold to market, had an almost equally depressing effect. Westralians have scarcely made a better showing, with the exception of a noteworthy improvement in Kalgurlis of £2⅞. Indian gold mining prices have also been marked by a drooping tendency, the decline in value of the Champion Reef mine in depth having created a feeling of doubt as to the permanence of the Kolar field. Some relief to the prevailing gloom has, however, come from the regions under the Southern Cross. Victorian and one or two other 'deep lead' shares have shown a welcome advance and all the Broken Hill mines have improved in market value with the sole exception of Block 10; while Waihi and Zeehan Montana are in the same favorable category. The most gratifying retrospect of the mining year is that furnished by copper shares, which have risen vigorously, with the solitary exception of Spassky. Rio Tintos have created a record by rising 23 during the twelve months. Cape Coppers are up 3¼, Tharsis 3, Anaconda 2¼, Cerro Mureano 1¼, and Namaqua has had a brilliant year. In American-managed mines, Esperanza, (Mexico), in spite of the continued high returns and the absence of any adverse reports from official sources, has not been able to maintain its value on the market, the price of the stock having fallen to about one-half of the big figure with which it started the year. Dolores, which sold for a short time up to £2¾, has declined on the reported delays in the completion of the mill, and in consequence of the variations in the engineers' statements as to the value of the ore reserves, coupled with the new issue of £66,000

capital. Camp Bird, after a period of enforced inactivity, has resumed milling with a profit at the mine for November of $142,000. Siberia as an attractive field—wide enough in all conscience—for the mining speculator, has enjoyed much energetic and eloquent advocacy during the year, and in a limited sense it has a certain vogue. The high expectations in the cases of recently floated gold mines in that region can hardly be considered as likely to materialize to the extent which would warrant the existing premiums on the amount of stock involved. The record price for tin—£215 in May last—has given an impulse to Cornish mining which it badly needed. Dolcoaths have doubled in price and East Pools have risen from £2¾ to £12¼. In a comprehensive review of the tin industry the Camborne correspondent of *The Financial News* gives the following interesting table:

Period.	Tons black tin.	Value.	Average price per ton.	Average price white tin.
1841- 0	89,120	£4,010,400	£45 0 0	£66 0 0
1851-60	96,572	6,592,639	66 15 6	114 10 0
1861-70	144,462	8,611,467	61 17 6	66 0 0
1871-80	145,112	7,963,489	56 0 0	108 5 3
1881-90	112,510	7,648,106	53 0 0	98 0 0
1891-00	101,411	4,731,495	46 15 0	85 8 0
1901	7,288	478,559	65 13 3	120 0 0
1902	7,560	513,872	67 19 5	121 0 0
1903	7,982	532,450	72 2 8	128 0 0
1904	6,742	479,633	71 2 10	128 10 0
1905	5,796	480,628	82 18 5	150 0 0
1906	6,006	630,067	111 0 8	— — —

The same correspondent remarks that those who are unfamiliar with the mining industry expected to see a much larger increase in the quantity of tin sold during 1906; but it is impossible to equip a Cornish mine, however rich, in the time that it takes to open up a new grocery business, hence the absence of the recently formed companies from the list of producers. The increase shown has been made by the old concerns. On the face of it, the increase of 210 tons would seem highly satisfactory; but it must be remembered that 27 ticketings took place in 1906, as against 26 in 1905. The quantities sold, in tons, by the mines in 1906 and 1905 respectively are: Dolcoath, 1,865 and 1,662; Carn Brea and Tincroft, 868 and 807; Grenville, 727 and 835½; Basset, 696 and 752; East Pool and Agar, 617 and 552; West Kitty, 371 and 296; Levant, 225½ and 267½, South Crofty, 169 and 292½; Clitters United, 157½ and 127; Botallack, 58½ and 40; Wheal Kitty, 47½ and 37½; Bunney Mines, 30 and 54¾; Commerce, 24¾ and 6¾.

Among the new companies registered during the year are the following:

	Capital.
Alfred Mines	£ 30,000 In £1 shares
Cornish Consolidated Tin Mines	100,000 " 1 "
Condurrow United Mines	30,000 " 10s. "
Duchy Development Association	20,000 " £1 "
Herberton Tin Syndicate	10,000 " 1 "
Wheal Vor	60,000 " 10s. "
Wheal Geevor	40,000 " £1 "
Cornish Tin Properties	20,000 " 1 "
Wheal Merth	10,000 " 1 "
South Crofty	50,000 " 1 "
Botallack Mines	150,000 " 1 "
Wheal Commerce	50,000 " 1 "
Wheal Kitty and Penhalls United	35,000 " 10s. "

It is reported that the labor problem in Cornwall this year has been the very antithesis of the general experience of this country, the difficulty being where to get the men for the work, and not where to get the work for the men. The number of miners who have returned from foreign fields has been smaller than the mine managers had hoped for, and the extra laborers have been drawn from other sources, including London and the Midlands. The close of the year has witnessed the consummation of negotiations, which had been going on for some time, for the purchase of the Tehidy Estate interest in West Cornish mine 'dues.' The time was, within living memory, when the Bassett family realized an income of £30,000 yearly from this source. Now the more modest sum of £10,000 to £12,000 is mentioned, although it is said that under the existing leases the mines could be required to pay nearly double that amount. The mines affected include the Dolcoath, which produces £200,000 of mineral per annum and is the deepest tin mine in the world. The others are the East Pool & Agar United, Carnbrea & Tincroft, South Crofty, and Basset Mines, as well as the tin streams that contain the tailing from the mines. The announcement of this deal, involving the removal of an ancient landmark, has apparently been too much for the nerves of local stockholders, as a general slump in prices on the Redruth Exchange is reported. The idea of having to make arrangements for 'dues' and leases with a Board of London financiers in place of the 'Lords' Agent, generally a local man, will require some little time to take root. It is said, however, that there are good grounds for believing that the syndicate, which has made this purchase by an outlay of probably some hundreds of thousands of pounds, will treat the present shareholders in the mines liberally; but at the same time the mining experts of the syndicate are so thoroughly conversant with the needs of the industry that they will probably be able to arrange for an increased and more economical output from the mines, which will enable the shareholders to pay full dues and at the same time to receive highly satisfactory dividends. As to the outlook for the new 'Lords,' it must depend on the energy and success of the developments in the old-established mines, as well as on the re-opening of old ones and the taking up of new mining 'setts' by the continuous introduction of capital into the county. In these operations the financiers in question will in all probability have a direct contributory interest from which the old 'Lords' held themselves aloof.

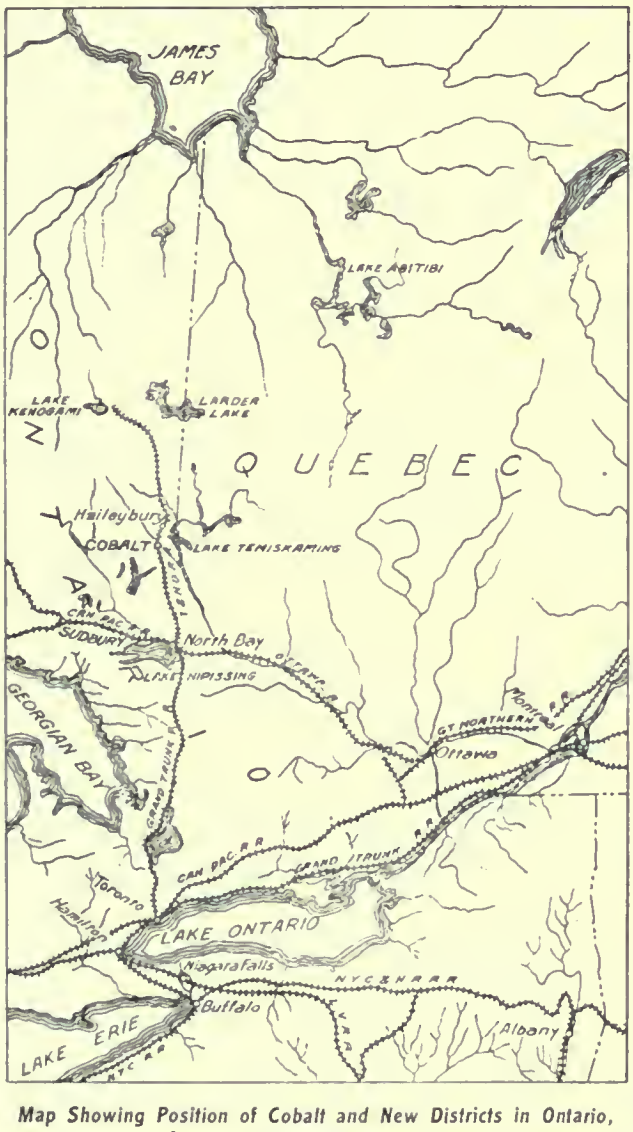
Toronto, Canada.

Canadian Mineral Output.—Mr. Low's Warning Concerning Cobalt.—Progress on the Yukon.—Railroad Extension.—News From the Cobalt Mines.—Activity at Manitou Lake.—Silver Near Port Arthur.

A summary report of the Canadian Geological Survey for 1906 has just been issued. It notes the great progress made in the mining industry during the year, and states while figures are not yet available, they will undoubtedly show a large increase over the output of 1905, which was close upon $70,000,000. Higher prices have helped to increase the value of the output and to stimulate development. Dealing with Cobalt, the director, Mr. A. P. Low, says that he spent three days in inspecting a number of the most promising mines and claims, and saw enough to pronounce upon the phenomenal richness of the numerous veins. The question of the depth to which silver will be found, however, is one upon which no opinion can or should be given with the data at present available. Granting only a moderate depth, there is ore in sight sufficient to produce millions, and only a portion of the deposits has as yet been uncovered. It might be wise, the report continues, for the investing public to consider the large capitalization and abnormal prices of stock of many of these properties, and the large production required to pay a fair profit. Attention is also called to the limited area covered by silver-bearing veins, and the natural impulse to consider properties situated in the vicinity of bonanza claims as being themselves of great value when the reverse is often the case. The reported discovery by Mr. Dowling of a large coal field, extending northward from Saskatchewan past the Brazeau river in proximity to the Grand Trunk Pacific Railway route, is officially confirmed.

Another report dealing mainly with the mining indus-

try recently presented to the Canadian Parliament, is that of W. B. McInnes, late commissioner to the Yukon territory, on the mining and general conditions of the territory. The report deals with the passing away of the more primitive methods of working, which have been largely discontinued during the past summer in favor of operations by large hydraulic plants and dredges. The old process of prospecting by shaft-sinking has been extensively superseded by steam-driven drills. Many of the owners of claims on the older creeks and hills suspended work by the more primitive methods, to await the installation of dredges or a large supply of water. The transition going on accounts for a temporary reduction in the gold output. On the Bonanza, Eldorado, and Hunker creeks, and their tributaries, lying north and west of the Indian river divide, the transition is almost complete,



Map Showing Position of Cobalt and New Districts in Ontario, Canada.

but placer methods, aided by some mechanical contrivances, still obtain on the Indian river side, including Dominion, Gold Run, Eureka, Sulphur, and Quartz creeks.

The Temiskaming & Northern Ontario railway commission has authorized inspections preliminary to surveys for branch lines to the Larder Lake district, and to Portage Bay, the western extension of the Cobalt area. The Larder Lake branch will run from Englehart and will be from 12 to 16 miles long. The Portage Bay branch will be run either from Cobalt or Gillies station and will be five or six miles long.

The Provincial Bureau of Mines has received a fine specimen of ore from the Jacobs mine, Cobalt. It is of dyscrasite, a combination of silver and antimony, and weighs about 10 lb.——Charles A. O'Connell, manager of the Green-Meehan mine, reports that the extraction of ore from No. 1 vein has been going on steadily since Oct. 24. There are two separate shoots in this vein. The south shoot is yielding high-grade ore for a length of 67 ft., the average width being seven inches. The ore of the north shoot, also high-grade, is 5½ in. wide, and is being worked for a length of 45 ft. All the ore is got out by the underhand stope or open-cut system.——A nugget of silver from a recent rich strike at the Temiskaming mine is on view in Toronto. It assays 16,038 oz. per ton, or 50% silver. It was taken from the 70-ft. level of a shaft that is being sunk on the vein. The vein is eight inches wide at this point. The Trethewey mine has now five cars of ore at the Ledoux smelter in New Jersey, F. C. Loring, consulting engineer, is assisting in the sampling and returns are eagerly awaited.——Work on the Big Pete mine, recently acquired by the Cobalt Central Mines Co., is being pushed under the direction of J. M. Elmer, who gained his experience in the Klondike. Ore from a depth of 40 ft. assayed 4,816 oz. silver per ton. An assay from the lower levels showed 1,100 oz. per ton.——The Gamey property north of the Buffalo and west of the Coniagas is to be actively developed. A 60-h.p. boiler and a four-drill compressor are to be installed and about 40 men employed. At the 50-ft. level driving will be done both ways, and the shaft continued. When the shaft is down 100 ft. a cross-cut will be run. Capt. Terrill is mine superintendent, and Albert C. Houghton, consulting engineer.——The Temiskaming & Northern Ontario railway commission has made arrangement for the issue of returns of shipments of Cobalt ores weekly, instead of monthly as at present.

There is a demand for gold-mining properties in the Manitou Lake area, northwestern Ontario. Development operations are being vigorously carried forward by R. B. Nickerson, the superintendent of the Laurentian mine, ore extraction being in the meantime partially suspended. At the Paymaster mine a cross-cut is being run at the 200-ft. level. The shaft was being put down to the 400-ft. level, but operations were temporarily suspended by flooding and additional pumping power is required before the work can be resumed.——Active production is going on at the West End silver mine in the Port Arthur district under the direction of Capt. Hansen. Frequent shipments of ore are made averaging about $15,000 per car.

Salt Lake, Utah.

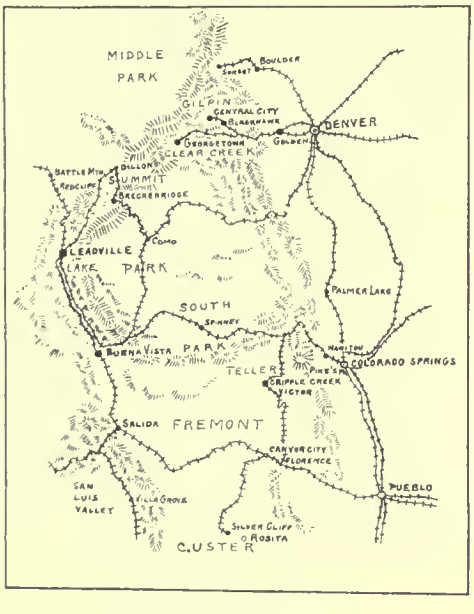
Scarcity of Fuel.— Consolidation at Bingham.— Choosing New Smelter Sites.— Hope of Adjusting Trouble.— The Coal-Land Frauds.— Indictments Found.

On account of the scarcity of fuel, mining operations in Beaver county are much handicapped at the present time. The mill and mine of the Newhouse corporation is closed temporarily; while the Frisco Contact Co. is unable to start its new machinery. The recent heavy snow-fall in that portion of the State has also interfered. —— The management of the Utah mine, at Fish Springs, has kept up the usual shipments, notwithstanding the recent burning of its hoisting plant. The timbers in the shaft were destroyed down to the 500-ft. level. Another shaft is being used for ore extraction. —— The management of the Indian Queen mine has reported the strike of an important body of lead-silver ore.

The Consolidated Mercur has been successful in getting enough fuel for the roasters at the mill, and production is back to about normal. —— The annual meeting of the shareholders of the Ingot Gold Mining Co. is scheduled for this week. It is likely that development work will be resumed. This company's property adjoins the Consolidated Mercur.

Steps have been taken to bring about a consolidation of the Bingham Central and Bingham Standard companies. At the annual meeting of the first named, Samuel Newhouse was named as president; D. C. Jackling, vice-president; W. M. Bradley, secretary; Charles W. Whitley, treasurer. This company has about $26,000 in its treasury, in addition to 106,000 shares of stock.—— It is believed that the project to extend the Mascot adit of the Dalton & Lark mine into the domains of the Ohio Copper Co., since the latter is now controlled by the same interests as the former, will be carried out; that a concentrator will be built near the mouth of the adit. The site of the Bingham Consolidated smelter has not been fully decided, but the impression prevails that it will be on the Josepa ranch, about 50 miles west of Salt Lake.—— W. G. Sharp, president of the United States Smelting, Refining & Mining Co., has been in Utah inspecting several sites for a smelter. This company and the American Smelting & Refining Co. are endeavoring to adjust matters with the farmers and the courts so that they may be permitted to retain their present smelters in operation indefinitely.

Ore shipments from Park City last week amounted to 1,688 tons, the shipping mines being: Daly-Judge, 671; Little Bell, 81; Ontario, 47; Silver King, 496; Daly-West, 393 tons.——The management of the Naildriver mine at Park City has decided to resume work.——The annual meeting of shareholders of the Lower Mammoth Mining Co. resulted in the election of A. C. Ellis, president; John Dern, vice-president, and August Reeves, secretary.——The management of the Colorado and Uncle Sam Consolidated mines reported good developments during the past week.



A Part of Colorado.

A copy of the articles of incorporation of the Markham Gulch Milling Co. has been filed with the Secretary of State. Walter C. Orem is the local manager. The company is now erecting a concentrating mill at Bingham; Boston capital is interested in the enterprise.

The Federal grand jury has brought indictments against C. M. Freed, Walter G. Filer, Don C. Robbins, and E. W. Senior, charging them with being implicated in the southern Utah coal-land frauds. A civil action has been brought against the estate of the late S. B. Milner to regain title to several thousand acres in Iron, Emery, and Carbon counties. The Federal judge, John A. Marshall, in a decree rendered a few days ago, holds that not only does the State have no right to dispose of lands known to contain coal, but, if title passes and it subsequently develops that coal actually underlies the land (although it was not known at the time that such was the case), it is not only voidable, but void. This ruling was made in sustaining demurrers of the defendants in the cases of the United States against the Utah Fuel and Pleasant Valley coal companies, the former to quiet title and the latter to annul certificates of lands by the Interior Department to the State of Utah for fraud, mistake of fact, and error of law in the proceedings ending the certification and because of the land being mineral and not a character intended to be granted by the Government to the State.

Cripple Creek, Colorado.

Successful Leasing.—Strike in the Findley.—Homestake Mills Leased. Another Cyanide Mill.—Change in Smelter Rates.

The north end of the Little Clara claim of the Work Co. is to be operated shortly by the Union Leasing Co. It is proposed to sink a shaft to cut the big ore-shoot being worked by Marsh, Hodges & Co. on the south end of the claim. Eleven air-drills of the buzzer type are being run on the latter lease. Good ventilation of the workings is obtained from a connection with the Callie shaft, and also from a No. 8 blower operated by a 15-h.p. electric motor, which is started up after blasting. Three shifts are running, as the production is being forced owing to the expiratiou of the lease next March, a renewal being uncertain. In the neighborhood of 75 tons per day is being shipped.

A strike of good ore is reported to have been made on the Findley mine on Bull hill. At a depth of 850 ft. on the tenth level a new vein has been encountered and from the assay-returns the ore should ship between two and three ounces. The Findley ore is to be treated at the Portland mill at Colorado City until such time as the Golden Cycle is in operation. This will be the first custom ore the Portland mill will have treated.——A five-year lease has recently been granted to the Phœnix Leasing Co. by A. W. Grant, receiver of the Cripple Creek Homestake Mining & Milling Co., on the Ironclad, Annex, and Pard claims, and the larger of the two Homestake mills. Mining operations will be started at once. It is expected that the mill will be overhauled and put in shape for the hauling of ore by March. The royalties range from 5 to 20%. About 12 months ago a similar lease was granted on the Magna Charta and Quartzite claims and the smaller mill, to the Ironclad Leasing Co. This mill has a capacity of 150 tons per day and has been operated very successfully during the last year.

It is stated that the big building of La Bella Electric Light & Power Co. at Goldfield will be converted into a cyanide mill. The engines and boilers are now being removed. The solid construction of the building, as well as its situation, will admirably fit it for the above purpose.——The Western Investment Co. has struck some good ore at a depth of 450 ft. on Work No. 4 adjacent to the Doctor-Jack Pot on Raven hill. The vein is 18 in. wide and some very high assays have been obtained; the ore is said to resemble that of the Mary McKinney.—— The charges of freight and treatment on ores of the district have been changed again by the trust. On and after January 5 the rates in force are one dollar per ton less than the old open rates, so that the camp now benefits only to the amount of about a dollar per ton over last year's open rates.

Sinking has been resumed in the Ophir shaft on Raven hill, from 700 to 800 ft.——The Victor, one of the earliest profitable mines in the district, is still productive. Lessees are getting good ore at 300 ft. There are large bodies of low-grade stuff in the old workings that are likely to be worked before long.

Mining Summary.

ALASKA.

The Silver Bow Basin railroad, promoted by the Alaska-Perseverance Mining Co., is to be built by the company, and not by contractors. The Juneau terminus will be at the city wharf. The road will be operated by electricity, narrow-gauge, with 35-lb. rails, and low rates are promised from Basin.——The Reynolds-Alaska Development Co. will install a complete electrical equipment on La Touche-Iron Mtn. mine on Prince William sound. The present equipment consists of a Pelton water wheel, two 50-kw. generators, an electric hoist and pump, and four Temple pneumatic electric drills.——Andrew Mitchell and George Francis have discovered a good quartz lode near McGinniss creek, about 15 miles from Juneau.——There is much activity on Hastings creek. Belleview brothers are working five men between Hastings and Saunders creeks, and many others are operating here and in Gross gulch.——The Conrad mines near Conrad City, in the Windy Arm country, have resumed work, a force of men being employed on the Venus, Vault, Montana, and Big Thing group of quartz claims.

The Gold Commissioner's department at Dawson has just laid down two important rules relative to the privilege extended under section 21 of the Yukon placer mining act recently put in force. One rule is that any one using two powers of attorney, as provided in the code, will not be permitted to record under the regulations, unless outfitted for an expedition of at least three months. The second rule is that no man, staking with powers of attorney, will be allowed the discovery claim unless there is gold discovered on the claim. When a man stakes a claim alone, he does not have to find gold. In respect to staking when there is no power of attorney held, the code simply says that a man locating the first claim on any stream, bench, or bar, may locate 1,500 ft. When staking with the power of attorney, a man is allowed to locate on any stream on which he makes a discovery.

ARIZONA.

COCHISE COUNTY.

The Arizona & Michigan Development Co., at Johnson, is still sinking its double-compartment shaft. The annual meeting of the stockholders of the company was recently held at Benson.

GRAHAM COUNTY.

George Dudley, the manager of the Standard mine at Metcalf, is working a full crew of men since the re-opening of the Coronado railroad. The tunnel is being driven at the rate of two feet per day to cut the Copper Centre vein.

MARICOPA COUNTY.

The Relief mine, northwest of Phoenix, is running its mill in 12-hour shifts, as the water supply is too small for a continuous run. Development work is at present confined to the 300-ft. level.

MOHAVE COUNTY.

The Lew-Claire Mining Co. is prospecting with a diamond-drill on its property on Bill Williams Fork. The drill cuts a 6-in. hole and takes out a 4-in. core. Lewis Dewitt is the superintendent.—— Brownsville is a new mining camp in the eastern part of Mohave county. The ore is copper and gold, and the Iowa Development Co. is working a force of 75 men.—— The Big Sandy Co. is operating four miles below Signal. A shaft is being sunk on the Suncloud claim.—— The Standard Co. has reached a depth of 300 ft. on its property southwest of Yucca, at the lower end of the Chemehuevis Mtn. The principal stockholders are Chicago people.—— A $60,000 bar of bullion was shipped from the Goldroad mill to the San Francisco mint, the result of the clean-up after a 15-day run.—— J. R. Garnier, of Los Angeles, has made the final payment on claims in the Cerbat region. Work has started on the St. Louis property under Lew Stirzel, the superintendent.—— The vein in the Banner mine, at Stockton Hill, has widened to four feet. The adit is in 1,800 ft. on the vein.

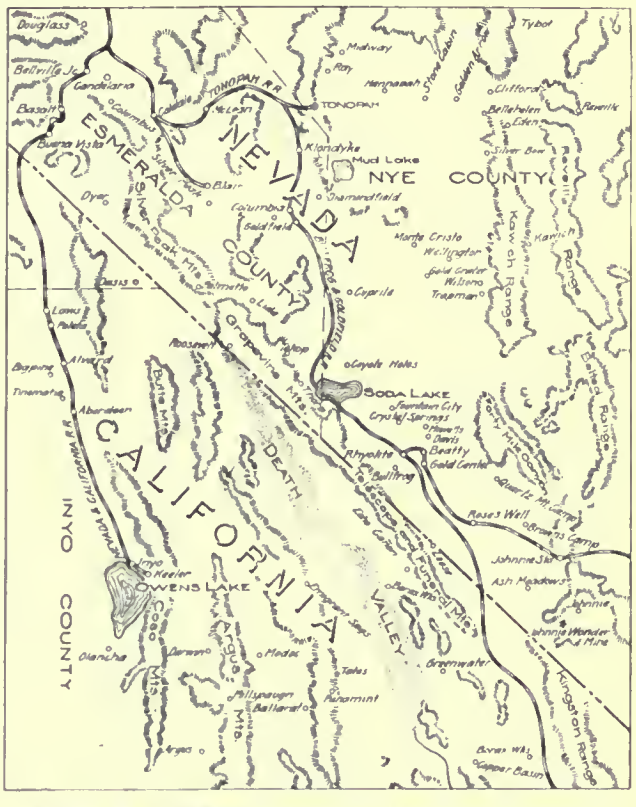
PINAL COUNTY.

The National Mining Co. has under bond the Bryan group of claims, near Kelvin, and the second payment on the purchase price was recently paid to J. K. McCarthy, of Kelvin, and Mrs. Alfred Kinney, of Globe.

CALIFORNIA.

AMADOR COUNTY.

The repairs in the shaft of the Zeila have been completed and the mill started. The chlorination works have been running continuously, as a large stock of concentrate had accumulated before the shut-down.——The Bunker Hill mill treated 2,646 tons of ore in 27 days during December, yielding $14,879 in gold bullion, and 42 tons of sulphurets worth $3,265, making a total of $18,144 for the month. The average yield per ton was nearly $7, and the net earnings $11,500. With the exception of the Argonaut, this is the heaviest



Map of the New Mining Districts of Nevada and California.

producer per stamp in the country.——The mill of the Central Eureka Co. was operated 21 days during December, running at about 60% of its full capacity. During that time it crushed 2,900 tons of ore, which yielded $10,330 in bullion, $2,086 in concentrate, $22 in slime—total, $12,438. The net profit for the month was $2,400. Some trouble between the miners and operators of this property has arisen, due to the poor condition of the hoist-signal apparatus, resulting in the closing of the property.——W. J. McGee has sold part of his interest in the South Eureka to Henry Mallock, who succeeded him as president of the company. The mill is running steadily.

CALAVERAS COUNTY.

The Swiss mine at Railroad Flat is keeping the 10-stamp mill supplied with ore. The upper tunnel is 400 ft. long, and the lower one, at the mill level, is 1,100 ft. long. The entire plant is operated by water-power. The vein is five feet wide at the bottom of the shaft, and averages $6 per ton. A. F. Merell is superintendent.

KERN COUNTY.

The Allie mine in Ivanpah valley has been purchased by Greening & Weinberg from William McFarlane, who located it in 1870.

MONO COUNTY.

The Masonic Mtn. Mining Co. has ordered a mill from San Francisco.——The Standard mine at Bodie has been closed on account of lack of water for power purposes.

NEVADA COUNTY.

The strike of the Grass Valley miners, which has been on since the first of January, has been settled. The miners

agreed to accept the proposition of the State Labor Commissioner, and returned to work on the eight-hour plan, pending the decision of a committee of owners and operators, as to what constitutes an eight-hour day. A unanimous vote was cast in the Union Hall, in favor of accepting the terms, and great rejoicing followed the settlement. The outcome of the conference between the representatives of the miners and operators was the adoption of the following schedule: Start work at 7 A. M., drop tools at 12, pick up tools at 12:30 and drop tools 3:30, the men to be hoisted as expeditiously as possible; night shift on same number of hours, as arranged by the superintendent. This schedule holds until 30 days' written notice of change is given by either side, which will assure ample time for the consideration of whatever issues may arise.——The Alleghany company will start their hydraulic mine at Balsam Flat, on the McNulty claim, as soon as the weather moderates and more water is available. The new pipe-line is finished and the monitor in place.

SHASTA COUNTY.

(Special Correspondence).—In spite of trying weather conditions, considerable activity in railroad construction continues. The Mammoth Copper Mining Co. is conspicuous for its several new undertakings. Eighty men are grading the railroad to connect the Quartz Hill mine with the Southern Pacific. The supply of silicious ores to furnish flux for the recently developed orebody of the Mammoth mine is apparently causing some anxiety, and this company is bonding several properties on the west side of the Sacramento. A contract has been let to haul 50 tons of ore per day from the Rattle Snake mine, situated five miles west of Redding, and the Bowery Belle mine, two miles west of Keswick, is being examined by them.——In the French Gulch district, rich ore has been found in the Washington and Gladstone mines. The latter is now beyond doubt one of the most important producers in this country, though it was sold a few years ago for the value of old machinery on the claim.——Near Centerville several promising prospects are being developed. At the Yankee John mine, a hoist is being installed and the shaft will be enlarged and sunk further. This is a district which has not received the attention which it deserves, because it is a low undulating country, and vein mining has been handicapped by the necessity of sinking shafts and handling considerable quantities of water.——A compressor has been put in at the Little Nellie mine at Iron Mountain. This property is owned by a Pittsburg company.——The Northern California Power Co., which supplies motive power to all the principal mines and smelters in the county, is making preparations to install a 12,000-h.p. electric plant at Battle creek, about 30 miles southeast of Redding. This will be the third large generating station belonging to this company. The Battle creek dam will take nearly a year to build and this work will give employment to over 200 men.

Redding, Jan. 22.

The Mammoth Copper Co. has voluntarily increased the wages of all its employees. About 700 men are affected. The increase will average about 8%, and it is stated by the company that it is the high price of copper that makes the raise possible, and that the increased scale will be in effect until the New York price of electrolytic copper drops below 18 cents per pound. An eight-hour day has been in force at the mine for some time. Fred Lyon is manager of the property, and A. S. Haskell is assistant manager.

SIERRA COUNTY.

The repairs on the 25-stamp mill of the Empire Co. at Gold Valley have been finished, and the entire plant is in good condition for a long run.

The Soda Springs quartz properties have been bonded by E. A. Work and Wm. Penman to Tonopah parties. Five claims are included, and a tunnel is to be driven to the vein.

SISKIYOU COUNTY.

A force of men is at work in the Blue Ledge copper mines in the Elliott and Joe creek sections, near the Oregon line. The new town of Hutton is a lively little camp, situated on Joe creek. The headwaters of Beaver creek are being prospected for copper. Work will soon start on Klamath and Scott river placer claims. All of the placer work is abandoned during the cold weather, and all the stamp-mills are closed down.

Work has been resumed at the Hardscrabble mine, and the Helena mine near Callahan will soon start operations. ——The Whiting Hill mine at Scott Bar will start work with L. E. Hicks in charge.

COLORADO.

The big Camp Bird mill is now running nicely and the Silver Lake mill is nearing completion. The latter will have a daily capacity of 450 tons. The non-operation of these two big mills made a large hole in the 1906 production of the southwestern part of the State.

The famous old Cashen copper mine in Paradox valley, about 12 miles east of La Sal mountains, and close to the Colorado-Utah line, has been sold to the Exploitation Co., of America. Edwin N. Hawkins, of Denver, has been appointed consulting engineer, and active development will be undertaken at once.

GILPIN COUNTY.

The Federal mine, in Russell gulch, adjoining the Old Town on the west, has been leased and bonded for $22,500 by Eastern parties, represented on the ground by W. E. Campbell. The shaft is down 400 ft.——The Bald Mtn. Co., owning a group of claims in Gilpin and Clear Creek counties, is composed of Illinois and Colorado people. L. D. Bloom is the manager. The shaft is down 150 ft. and tunnels are started.——At the Pittsburg mine of the Cashier Co. in the Russell district, work is being done on the sixth and seventh levels, and a cross-cut is being driven from the 300 level toward the Meeker shaft. The shaft is down 720 ft., and 20 men are employed under William Auger, the superintendent.——The main shaft at the Saratoga mine is down 1,000 ft., and is being pumped out, the water now standing below the 800 level.——The Faraday Co., in which Omaha people are interested, is asking for bids for sinking its Argo shaft, situated east of the Alva Adams mine in the Russell district. The shaft is down 160 ft. and the bids are for 100 ft. more. ——About 20 men are at work at the East Notaway mine, operated by the Town Topics Co. Ore is shipped regularly, and milling ore is going to the custom mills. Tom G. Martin is superintendent.——The Eureka mine in Prooser gulch is shipping ore steadily. John C. Jenkins is the owner.—— Wettstein & Co. are working the Fagan property, up Prosser gulch, under a lease from the Gurnell Mines Co.

GUNNISON COUNTY.

The Pitkin district contains several active properties. The Raymond tunnel is in over 2,000 ft. and the mill is making concentrates worth $60 per ton. The mill feed is derived from development work, no stoping being done.——The Gold Links tunnel, paralleling the Raymond, is in over 3,000 ft. and the company will have its mill in operation by the first of June.——The most recent strike in the Carter tunnel was a vein 35 ft. wide, carrying streaks of $10 ore, and the tunnel is still progressing toward the volunteer vein. ——The Grand Prize is shipping ore, and the Maid of Athens, Citizen, and Napoleon have all been steady producers.——The Blistered Horn mill near Tin Cup is turning out concentrates from ore derived from development in the long tunnel.——In the Bowerman district, the Abe Lincoln Co. will build a mill in the spring, and the Gold Ridge has been financed by New York parties and will start work.

SAN JUAN COUNTY.

The Edward Ruth Co. has resumed shipments from the Esmeralda mine, which was seriously damaged last year by a snow-slide.——The Bullion King Co. has opened up some good ore, carrying copper, lead, and zinc, in a 15-in. vein.——The Aspen mine, managed by J. O. Campbell, is getting ready for stoping, preparatory to sending ore to the Silver Lake mill, which will soon be completed.——The Detroit and Colorado properties, locally known as the Champion No. 2, is installing new machinery, a 75-h.p. motor having just been put in place, with work on the erection of the new compressor progressing rapidly. During December this company shipped 10 cars of ore to the smelter, and L. L. Haines, the manager, states that shipments at the rate of a car per day will be begun in February.

SUMMIT COUNTY.

(Special Correspondence).—Work is going on in the Jessie property with a full force of men in mine and mill, and a car of concentrates is shipped each week.——The Swastika Co. is a new corporation formed to operate properties in Summit and Park counties and is capitalized for $2,000,000. Elgin Mawhinney and Joseph H. Chandler of Chicago, Andrew W. Gillette of Denver and C. F. Haselton of Breckenridge, are the incorporators.——The Col. Sellers' property in Kokomo, has been sold by Joseph A. Lamping to Horace B. Hawkins for $12,000. This will be worked under the name of the Delaware Gold M. & M. Co.——The Mize Co. has secured possession of the Winifred, Ruth, Marie, Dorothy, and Magnet properties.——The Vidler Tunnel Co. has acquired the Wilcox tunnel and railroad properties. It is proposed to extend the Denver, Lakewood & Golden railroad over Lookout Mtn., and to traverse the Vidler tunnel, thus making connection with Montezuma and Rathbone. The line will then join the Denver & Rio Grande at Dillon.——The Wellington Mines Co. is shipping ore at the rate of 75 tons per day. Peter L. Cummings has been appointed superintendent for the company.——The French Creek Tunnel Co. is to resume work in the cross-cut drainage tunnel in Bald Mtn. Mark G. Stevens is manager.

Breckenridge, Jan. 17.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—Idaho county is active. The Goodenough group of claims on Bear creek in the Marshall lake district is the scene of excitement. Rich ore is being brought to the surface. One chunk weighing 75 lb. is shot through with gold, and is estimated to yield $2,000. Nothing like it has ever been known in Idaho county, and Grangeville mining men are starting for the district.——Wesley Everett, manager of the Leslie mine, has just returned from a visit to the Silver Criss mine on the summit at Lookout, near the Montana-Idaho divide. He made an inspection of the workings of the Silver Criss, the mine showing a vein 15 ft. wide. The vein was cut at a depth of 75 ft. from the surface and 200 ft. within the tunnel. This vein will intersect the north and south vein, which was opened by a shaft 150 ft. above. It was from this upper tunnel that some of the best grade ore in the district was taken last year.——R. B. Painter, of the Marshall Lake district, brings news of a strike of gold-bearing quartz in the Lake View claim, recently acquired by Mr. Painter, C. G. Kahn, Frank Baker, and John Morgan, of Spokane. A seven-foot orebody carrying gold was cut by the shaft at the 65-ft. level. The property has been shut down for the winter, but the owners will start work next spring. A copper strike is reported by James Taylor, part owner of the Bullion mine, who announces that six feet of concentrating ore has been encountered in the lower tunnel.——C. W. Hadley, one of the principal owners of the Washington Meteor mine, says that rich ore has been found in the five-mile tunnel, the lode being from 12 to 16 ft. wide. The company is installing a 40-stamp mill and it has other heavy machinery.——A 100-ton electro-cyanide plant has been ordered from a Portland firm for installation on the Clearwater group early next summer. This group is on the Clearwater river, about five miles from Elk City. It is owned jointly by George Esh and Mrs. H. Helbern, of Portland.——D. T. Loper and George Conner have sold a three-fourths interest in the Kimberly and Jewel claims, in the Marshall lake district, to E. B. Miller, of Los Angeles, for $25,000. Mr. Loper retains a fourth interest.——M. De Keyser, mining expert of Belgium, is in the Elk City district looking over the field with a view to establishing a custom mill. He represents French and English capitalists.

Spokane, Jan. 20.

LATAH COUNTY.

(Special Correspondence).—The Gold Bug copper mine on Jerome creek will be the first shipper in what is known as the Hoodoo and Gold Hill mining districts. Officers of the company announce that $15,000 worth of machinery has been purchased for immediate installation. Shipment of ore will begin as soon as the spur of the Washington, Idaho & Montana railway is completed up Jerome creek. The mine is probably the best developed property in the district. The shaft is down to the 300-ft. level, showing values in gold and copper of $60 per ton. Lellis F. Smith, of Colfax, is president of the company.

Spokane, Jan. 20.

SHOSHONE COUNTY.

(Special Correspondence).—Much development work is being done at Murray, on the north side of the Cœur d'Alene mining district, and it is believed that the output of silver and gold will be large this year, as nine mills, with 68 stamps and two galena concentrators, are being overhauled for operation, and a three-stamp mill is working. Other properties with mills are: The Golden Chest mine, Morris Haymon, of New York, president; The Golden Reward, 20 stamps; the King, the Yosemite, Daddy, and Mother Lode, 10 stamps each; the Lyon and the Buckeye, three stamps each. The Lyon mine was operated last winter by Silas Bunch and William Wylie under a lease and they took out $17,000 in three months. The Golden Reward has also produced rich ore, while the Pilot stands at the head of the list of producers. The Cornucopia, Gold Back, the Emma, the Eureka, and the Dew Drop are also promising properties. One pocket in the Emma netted its owners $30,000 eight years ago, but now the property is at a standstill.——The Pilot mine, where John Docktor, Louis Prager, and Frank Frohling made a sensational discovery a few months ago, now has a tunnel of 500 ft. and the paystreak is holding its own. Thirty tons of good ore are ready for shipment. The property was bonded some time ago by a Cœur d'Alene syndicate, headed by the Day brothers, but lapsed after the first payment was made.——The Bear Top concentrator is running. The Black Horse mine is also on a shipping basis. The controlling interest has been bonded for $100,000 to the Federal Co. The mine is a galena proposition and has a developed vein of four feet, some of which is shipping ore. No ore is being mined, however, as the owners are awaiting transportation facilities. The Monarch mill is idle and no ore is mined, all work being confined to driving a tunnel, of which 300 ft. remain to be done.——L. W. Stedman, manager of the Chicago-London and the Paragon properties, announces it is expected to begin shipping soon. The former has a compressor plant. The Cedar Creek prospect has encountered shipping ore in its tunnel of 600 ft., which is being driven by J. H. Jackson and John M. Weyer. With such transportation facilities as will be offered in a year by the Idaho Northern and the Oregon Railroad & Navigation companies the district should develop rapidly. Murray is a camp dating from 1883, when A. J. Pritchard, pioneer gold hunter and pathfinder, panned out the first gold discovered in the district from the bed of the stream bearing his name. That was several years before galena was found in the Cœur d'Alenes.——The International Co. has secured two groups of claims for $35,000. One of the groups consists of four claims and adjoins the Bunker Hill & Sullivan property. These claims have been held and worked for years by pioneer prospectors and it is reported a 12-ft. lode runs through the property. The ore is silver-lead. The other group is across Pine creek. There are five claims, having a wide vein in which galena ore has been encountered. The company making the purchases also has 11 claims near the headwaters of the St. Joe which look promising and which will be developed. These are copper properties. The company is negotiating for four claims in the Pend d'Oreille district. The International will have its head office in Spokane. The capitalization is $2,500,000. A. E. Barnes is president, the other officers being as follows: Eugene Barnes, secretary, and Fred R. Lovell, treasurer.

Spokane, Jan. 20.

MONTANA.

MISSOULA COUNTY.

(Special Correspondence).—The Tarbox mine, situated three miles from Saltese, is opened to a depth of 600 ft., and has been developed by about 1,600 ft. of drifts, cross-cuts, and winzes. The vein dips 60°, being on a contact of quartzite and slate. The width between walls varies from 30 to 50 ft. The ore comprises galena, silver, and iron, in a quartz and quartzite gangue. Assays show values running $25 to

$50 per ton. The boiler capacity is to be increased and pumps installed, preparatory to sinking the main shaft 200 ft. deeper. By driving toward the body of the mountain on the strike of the lode, much greater depth below the surface is to be gained. The installation of a mill before the end of this year is contemplated. Richard Daxon, of Wallace, Idaho, is president of the company and manager of the property.

Missoula, Jan. 19.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence).—The Tyrone Development Co. has purchased a group of 10 claims about a mile north of the Robinson group, and adjoining the Top mine, for $125,000.——The Robinson mine is owned by W. C. Porterfield and his associates, and some strikes of high-grade copper ore have lately been made in the workings.

The Austin group has an excellent showing, and some rich new discoveries have recently been made in the Lost Bullion Spanish mine. A shaft which was sunk by a prospector in 1875 has a vein from 6 to 8 ft. wide averaging $30 per ton. This shaft is 75 ft. deep and a drift of 50 ft. along the vein shows good values. An old dump has been found

Map of New Mexico.

on another portion of the property and is being sampled by cuts and shafts. In the western part of the workings a new vein of ferruginous quartz has been struck which assays well in gold and silver. The company is considering the erection of a treatment plant of a daily capacity of 500 tons. W. E. Wilson is the president of the company.——An old property in the Chloride Flat district has been purchased by Eastern parties, and is shipping ore which nets $10 per ton. A survey has been made for an extension of the Burro Mtn. railroad from Silver City to Tyrone, and construction work is expected to start soon.

Silver City, Jan. 17.

NEVADA.

ESMERALDA COUNTY.

Many of the leases on the Mohawk have expired, and operations will be continued by the company. New ore-bins are being erected at the Mohawk, Red Top, and Jumbo. The company shaft at the Mohawk is being partly re-timbered to stand the heavy work that will be required of it. The Frances-Mohawk ground is being timbered in places which were weakened by the removal of pillars during the closing hours of the lease.——The Hayes-Monette lease on the Mohawk having expired the hoist is being moved to the Goldfield Columbia. M. J. Monette reports that the greatest production for one day was $60,000, the total production was $4,400,000, and the ore averaged $400 per ton. Most of the output was through No. 1 shaft. No fatalities occurred during the life of the lease and an average of 130 miners was employed for several months. The original lease was 373 by 700 ft., but two-thirds of this area was sold to other lessees.

LINCOLN COUNTY.

(Special Correspondence).—Edw. Carleson reports that he has struck the apex of the ore-shoot in the Wyoming-Searchlight mine in the north cross-cut on the 215-ft. level. —— Recently pay-ore was encountered in the Searchlight-Mammoth on the 100-ft. level. This find is surprising, as the best values are rarely found above water-level. Machinery necessary to sink to the 500-ft. level has been ordered.——To the north of the Wyoming-Searchlight, work on the Golconda has been progressing under the management of W. W. Burt. The shaft has reached the 200-ft. level, and cross-cuts will be run to the vein. In sinking, the shaft ran through 14 ft. of mineralized vein-matter at a depth of 90 ft., and another body, 10 ft. in width assaying $24, at a depth of 125 ft. The hoist installed on this property is in working order, and the shaft will be sunk to the water-level.—— The management of the New York Searchlight Co. has ordered a diamond-drill. The introduction of the drill in Searchlight will mean much to the owners that cannot afford to sink shafts in exploring their properties.—— The good ore recently found on the Stanley Forbes property, east of Searchlight, continues as work progresses. The adit is now in 130 ft. on the vein, and the orebody averages five feet in width. Jos. McArthur is in Los Angeles purchasing machinery for the mine.—— G. W. Huntington is operating the Superior-Nevada and Crescent Searchlight properties. Five feet of ore has been struck on the Superior-Nevada, running $36 per ton, and in the King Solomon tunnel the vein was intersected at 110 ft. A cross-cut showed nearly four feet of good milling ore.—— George Straub has let a contract to sink his 50-ft. shaft to water-level. This property is near the Wyoming-Searchlight, and a well-defined vein can be traced the entire length of the Bank Bell and Crystal claims. The shaft is being sunk on this vein, and the hoist has arrived and is being set up.

Searchlight, Jan. 14.

The Santa Fe extension into Searchlight will open on the first of March. This spur runs from Barnwell, into the camp, a distance of 23 miles.

LYON COUNTY.

Yerington is a growing camp and some excellent copper ore has been developed. The town is situated on the Walker river, 12 miles from Wabuska station, and 35 miles east of the California line. The altitude of the town is 4,300 ft. above sea-level, and the supply of water is good. The Nevada-Douglas ground is being developed, and the Ludwig property has recently changed hands.

NYE COUNTY.

The mines of Tonopah paid nearly $4,000,000 in dividends last year. The largest shipper was the Tonopah Mining Co., which sent out 67,000 tons; the Montana Tonopah, 4,650; Midway, 4,000; and West End, 1,000 tons. The Macnamara, North Star, and Jim Butler shipped 1,600 tons altogether, and miscellaneous shipments, 275 tons. The Tonopah Mining Co. has completed a 100-stamp mill at Millers, 13 miles from Tonopah, and the Midway mill has also been purchased. The shaft of the Belmont has been widened to three compartments and is down 1,100 ft. The Montana Tonopah company is erecting a 40-stamp mill. The Tonopah Extension has found the lode 1,200 ft. west of the shaft, and has developed an orebody 45 ft. wide. When the mills now in course of construction are completed, the output of the Tonopah district will be greatly increased.

STOREY COUNTY.

The Butters plant at Virginia City is being equipped for handling custom ores from various parts of the State. The tramway that will carry the ore from the Virginia and Truckee railroad to the mill in Six Mile cañon, a distance of three miles, is nearing completion. The buckets will hold 100 lb. each and will be 70 ft. apart on the cable.

WHITE PINE COUNTY.

The Cumberland-Ely Copper Co. owns approximately 650 acres of mining land adjacent to and intermingled with the property of the Nevada Consolidated Copper Co. Active development work has been under way for the past year and ore has been proved in a number of its properties. The most important find has been in the Veteran property where, at a depth of about 450 ft., a shaft has gone through 80 ft. of ore, from which a cross-cut has been run 180 ft. and drifts run 70 ft., all in ore that will assay from 3½ to 6% copper, with some gold values. From surface indications and results obtained by the Nevada Consolidated Copper Co., it is expected that this orebody will prove to be at least 1,400 ft. wide. The faces of all cross-cuts and drifts are in ore. The average ore thus far encountered in the Cumberland-Ely properties is similar to the ore of the Nevada Consolidated, but appears from the present development to be of a slightly higher grade. The estimate made by J. Parke Channing of the net cost of copper delivered in New York was 7.03c. per lb., deducting the value of the gold and silver produced.

The company is amply provided with working capital, having available approximately $3,800,000, including the proceeds of 100,000 shares recently offered for subscription to the stockholders and which was underwritten at $12.50 per share. Of this amount, between $2,500,000 and $3,000,000 will be used to pay for a one-half interest in the Steptoe Valley Smelting & Mining Co., the other half-interest to be owned by the Nevada Consolidated Copper Co. The Steptoe Valley Smelting & Mining Co. is now building a concentrating and smelting plant with a daily capacity of 4,000 tons of concentrating ore and 2,000 tons of smelting ore, which will be completed about Jan. 1, 1908. It is expected that this will be increased to a plant of 10,000 tons or more capacity. It will be located at McGill, 14 miles from Ely on the line of the Nevada Northern railroad, where the company has acquired eight square miles of territory and water rights of the entire section, with sufficient water to treat at least 25,000 tons of ore daily. The object of securing this large area is to prevent the possibility of any damage claims arising from the smoke nuisance or the pollution of water, as has been the case with the smelters at Anaconda, Montana, and Bingham, Utah. The Cumberland-Ely Copper Co. also owns a half interest in the Nevada Northern railroad, which road is already in operation from Cobre, Nevada, 140 miles to Ely. The other half interest is owned by the Nevada Consolidated Copper Company.

The officers and directors of the Cumberland-Ely Copper Co. are S. W. Eccles, G. M. Borden, George E. Gunn, William B. Thompson, Frank W. Hills, and Pope Yeatman.

OREGON.

BAKER COUNTY.

The Virtue Mines Development Co. is the name of the company that has effected a consolidation of 16 lode claims and three placers, including the old Virtue mine, with the Collateral, Virginia, and Little Pittsburg groups, making 400 acres of mineral ground situated 10 miles northeast of Baker City. J. K. Roming, president and general manager of the company, states that the Virtue mill is being overhauled and its 20 stamps, plates, and vanners put in order. Chas. P. Loomis is superintendent. The milling machinery and air compressor will be operated by electric motors, deriving their power from the Eagle river plant. The five veins on the property consisted of a fine-textured quartz gangue, carrying free gold and some sulphides, the walls being greenstone.

Articles of incorporation of the Sovereign Consolidated Copper Co. have been filed with the Secretary of State, and the organization was perfected on December 5, with headquarters at Baker City. This company has acquired a large group of copper claims situated on the east side of this county, near Sparta. The development of these properties is of more than usual interest and importance to those interested in mining in eastern Oregon. In the first place, the smelting outlook is brighter, with the prospects of obtaining a large tonnage of ores bearing iron and sulphur for fluxing, and copper, which is essential for the collection of the precious metals.

SOUTH DAKOTA.

PENNINGTON COUNTY.

(Special Correspondence).—In running a drift at the Clara Belle mine near Oreville, at a depth of 265 ft., a vein of tin ore was encountered four feet wide. It was followed 26 ft. Ten pounds of this average ore yielded four ounces of pure tin; 30 lb. of this average ore yielded 10 oz. tin of good quality. The ore also assays $1.50 in gold.

Boise, Jan. 8.

BRITISH COLUMBIA.

A crisis has been reached in the coal situation, and the Canadian Pacific railroad has formally notified the mines and smelters that they will not undertake to handle any more ore until further notice. The immediate result of the announcement was the laying off of the entire force at the Granby Gold Drop mine, and the reducing of the forces at all the other mines of the Boundary that rely upon this road for fuel and ore hauling, including the Dominion Copper, B. C. Copper, and Snowshoe properties. Later, the Granby smelter closed down, and over 350 men are idle. The Le Roi mine also closed down, but later started work again with coke sufficient to run the boilers for ten days.—The new electric hoist for the Centre Star mine, which is being built by Nordberg in Milwaukee, will be shipped about the middle of the month. This will be the largest hoist in the Dominion, being rated at 250 h.p.——The Great Northern will build a spur to the Victoria shaft, and the Canadian Pacific will lay a track to the Victoria head-works in the spring. This shaft will be the main working shaft of the Granby Co. It is down 400 ft.——Shipments for the week ending Jan. 12 were: Centre Star, 1,230; Le Roi, 2,065; Le Roi No. 2, 150 tons, and 680 tons milled. The Trail smelter received 3,735 tons during the week, other mines in the district contributing as follows: Snowshoe, 305 tons; Lorna Doone, Silverton, 85; Lightning Pete, Edgewood, 21; Queen, Salino, 27; Eureka, Slocan, 16; North Star, Kimberley, 61; Kootenay Belle, Slocan, 21, and Last Chance, Slocan, 66 tons.—— The Northport smelter is run by ore from Le Roi mine, receipts from that property amounting to 875 tons for the week.

To the north of the Boundary district there is some activity in copper properties. In the Similkameen valley is the Nickel Plate mine at Hedley, and the properties on Copper mountain, near Princeton. Still farther north, in the valley of the Tulameen, the Cousin Jack mine is being worked.—— The Nicola mining district lies 40 miles north of Copper mountain. Here are found copper, iron, and coal. The Asheroft and Highland Valley districts lie 40 miles north of Nicola lake. Here work is progressing at the Ivanhoe, Glossy, Transvaal, Highland, Keystone, Albatross, Ball, and Tamarack group of claims. Good veins have been exposed, and the district is a promising one for a future production of copper, transportation facilities being as yet entirely lacking.

The Dominion Copper Co. operates the Sunset, C. O. D., and Crown Silver mines at Greenwood, the Brooklyn, Stemwinder, Rawhide, and Idaho in the Phoenix district, and the Athelston farther north. The principal producers are the Rawhide, Brooklyn, Sunset, and Idaho. The ores run from 2½ to 3% sulphur, and they contain from 1.2 to 1.3% copper. They also carry small values in gold and silver. Shipments to the company's smelter at Boundary Falls, from all the mines named, amount to 650 tons per day, the product being a 45% matte, which is sent to the converters of the B. C. Copper Co. at Greenwood. The present capacity of the plant is being doubled by the addition of a 255 by 48 in. matting furnace, which will doubtless be blown in by March 15. A change from steam to electric power is being made, the electric power to come from the plant of the Cascade Power Co. at Grand Forks. The change, it is stated, will effect a great saving in the cost of power. Samuel Newhouse is managing director of the Dominion company, ex-Senator Warner Miller, of New York, being president. On the operating staff are T. R. Drummond, the manager; M. M. Johnson, the consulting engineer, W. C. Thomas, the smelter manager, and E. E. Gardinier, the mine superintendent.

Personal.

R. G. BROWN is in Siberia.

C. W. KEMPTON has arrived in Chile.

H. R. PLATE is inspecting mines at Ward, Nevada.

C. F. MOORE, of Salt Lake, is at Pachuca, Mexico.

FRANK MERRICKS left England for Peru on January 16.

JOHN B. FARISH has returned from Chihuahua to Denver.

PERCY E. BARBOUR is inspecting mines at Goldfield, Nevada.

GEORGE J. BANCROFT has returned to Denver from Nevada.

G. H. ATHERTON, of Cripple Creek, is on a visit to San Francisco.

DONALD B. GILLIES is visiting San Francisco from Tonopah, Nevada.

F. B. CLOSE is general manager for the Helvetia Copper Co., in Arizona.

S. E. BRETHERTON is visiting San Francisco from Redding, California.

C. R. FARQUHARSON has left London to proceed to the Federated Malay States.

R. DE SALLIER, chief assistant with R. M. Atwater & Co., is at Denver on business.

NORVAL WELSH is superintendent of the Santa Brigida mine near Chihuahua, Mexico.

T. R. MILLER, of Denver, is in the Black Hills of South Dakota on professional business.

E. A. H. TAYS is on his way to examine the Anderson lake mines in British Columbia.

S. A. WORCESTER, of Victor, Colo., is engaged in professional work at Bellevue, Idaho.

H. T. WILLIS has left the Dolores mine, Mexico, and is temporarily at his home in Illinois.

HOWELL HINDS is president of the Old Hundred Mining Co., operating at Silverton, Colorado.

F. T. BYRDE is on his way from London to Liberia, where he expects to remain 18 months.

HARRY A. LEE has been appointed consulting engineer to the Unity Mines Co., at Alta, Utah.

C. B. WINGATE has returned to San Francisco from an arduous trip to the mines of Death Valley.

JAMES ARKELL is general manager for the Santa Rita Mining Co., at Sombrerete, Zacatecas, Mexico.

F. X. MOONEY is superintendent of the smelter department for the Metals Extraction & Refining Co., Chicago.

FLOYD K. THOMPSON is the new manager of the Sierra Plata Mining Co., operating Los Muertos mine at Parral, Mexico.

CHARLES PFEIHL, of Denver, has just returned home after making some examinations of zinc mines in southwestern Missouri.

T. ELLIOTT SMITH has been appointed manager of the Santo Domingo Mining Co., at Etzatlan, Jalisco, to succeed W. M. MATHEWS, resigned.

PETER L. CUMMINGS, of Breckenridge, Colo., has been appointed superintendent of the Wellington Mines Co., operating in the Breckenridge district.

W. G. SHARP, president of the United States Smelting, Refining & Mining Co., is making an inspection of the Mammoth mine in Shasta county, California.

W. E. WILSON, of Boulder, Colo., has been elected president of the Lost Bullion Spanish Mines Co., of Silver City, New Mexico, and is now on a visit of inspection to the property.

THOS. M. HAMILTON, former superintendent of the Escuadra mine at Taviche, Mexico, is now general superintendent of the mining properties of the Braden Copper Co., at Graneras, Chile.

W. H. YEANDLE, JR., has resigned the management of the Cia. Minera El Banco y Anexas, Oaxaca, to accept the position of superintendent of the San Luis Mining Co., at Gabriel, Durango, Mexico.

T. F. TREWEEK has resigned his position with the Lustre Mining Co., at Santa Maria del Oro, Durango, to accept the position of chemist with the Tecolotes mines at Santa Barbara, in the same State of Mexico.

GEORGE E. HOWARD, formerly of the American Smelting & Refining Co., at El Paso, Texas, is the new manager of the Sahuayacan Mining Co. at Ocampo, Chihuahua. He succeeds JOHN C. TREADWELL, resigned.

ARTHUR WORSDELL will have charge of the cyanide plant and GEORGE S. EMBURG, of the concentrator, at the mine of the Coast Line Copper Co. at Querobabi, in Sonora, Mexico. JOHN HENDERSON, of Pasadena, Cal., is general manager.

Obituary.

WINFIELD SCOTT KEYES died in San Francisco on December 27, at the age of 67. He was graduated from Yale in 1860, and then studied for three years at Freiberg. After gaining some experience in California, he became superintendent of mines at Eureka, Nevada, where he and Arents invented the automatic tap for lead furnaces. Subsequently, he went to Leadville and was manager of the Crysolite mine at the time when it was prominent on the Stock Exchange of New York. At a still later period he was frequently an expert witness in mining litigation. During the last few years he engaged in mining in Mexico, and in wine culture in Napa county, California, receiving a gold medal for his wines at Paris in 1900. He lived at the Pacific-Union Club, and had a large circle of acquaintances.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, January 21.

Argonaut	$4.75	Standard	$2 90
Con. Virginia	1.18	Savage	1.03
Mexican	1.10	Sierra Nevada	0.75
Ophir	3.08	Yellow Jacket	1.13
Belmont	5.37	Montana	3.85
Jim Butler	1.25	Mohawk	17.00
Jumbo	4.35	Red Top	4.30
Jumping Jack	0.30	Sandstorm	0.73
Manhattan Con	1.00	Silver Pick	1.50
Midway	2.10	Tonopah Ex	5.65

METAL PRICES.

By wire from New York.

	—Average prices for week ending— January 17.	January 24.
Copper—Lake (cents per lb)	24½ @25	24⅝ @25
" Electrolytic "	24¼ @21½	24¾ @24¾
" Casting "	24¼	2 ¼ @24½
Lead "	6	6
Spelter "	6.70@6.75	6.70 @ 6.75
Silver (cents per oz.)	68¼	68⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	January 17. £ s. d.	January 24. £ s. d.
Camp Bird	1 7 6	1 8 6
El Oro	1 7	1 5 6
Esperanza	2 16 3	2 17 0
Dolores	1 8 9	1 7 6
Oroville Dredging	1 0 6 ex div	1 0 6
Stratton's Independence	0 3 9	0 3 9
Tomboy	2 2 6	2 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Jan. 24.	Jan. 24.
Bingham Central	2	2
Boston Copper	31⅞	31¾
Calumet & Arizona	180	183
Cumberland Ely	13	13
Dolores	7¾	8½
El Rayo	7	6½
Guanajuato Con	5	4⅞
Giroux Con	10	9⅞
Greene Con	30⅜	31⅛
Nevada Con	19¼	18½
Nipissing	14	13⅛
Tennessee Copper	50¾	49½
Tonopah Ex	5⅜	5⅛
Tonopah-Belmont	5¾	5¾
Tonopah	19⅞	18¾
United Copper	72¾	73½
Utah Copper	40½	40

(By courtesy of Hayden, Stone & Co., 26 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

MINERS are wanted at Cobalt, Ontario; they can get $2.50 per day and their board.

IT IS likely that there will be a rush in the spring to the Larder Lake district, north of Cobalt, in Ontario.

STATISTICS show that the occupation of a coal miner in England is ten times less dangerous to life than the occupation of a sailor.

FOR sinking oil-wells in Japan, reflected daylight is used. A piece of yellowish translucent oil-paper is suspended over the well at an angle of 45° and throws light down the pit. The wells are dug to a depth of 600 or 800 feet.

GREASE is so bad for amalgamation that sperm or paraffin candles are used at many gold mines, as they are less objectionable than those made of tallow. The latter do not stand so strong a draft, nor drops of water, as well as the former, but give less smoke, spoil less air, and do not gutter so much.

PROF. LANGLEY has shown that the Earth receives energy from the Sun at the rate of 25 h.p. per square metre, or the latter must radiate from its surface more than 100,000 h.p. per square metre. If the sun were solid coal, it could not maintain this supply by combustion for 3,000 years.

IN driving the Bell tunnel at the New Idria quicksilver mine (California), after an explosion of some inflammable gas, the tunnel was lighted by the reflection of the sun's rays. A mirror was kept at the mouth of the drift at the proper angle to effect this, and as long as the tunnel was driven straight it answered perfectly.

ACETYLENE LAMPS should be used by all shift-bosses and foremen who have the inspection of high backs or of much timbering. The newer forms can be turned in any direction, and can even be upset, without danger of extinction, while the increased brilliancy of illumination will soon pay for the first cost, by the rapidity and efficiency with which the inspection may be accomplished.

THE Australian miner uses a candlestick somewhat similar to the ordinary American holder. It is known as a 'spider,' and consists of a wire about one-sixteenth of an inch thick, hoisted into a spiral that holds the candle. The upper end is prolonged vertically upward, terminating with a hook for hanging, while the lower end is attached to an iron rod for thrusting into timbers or crevises.

VAN HISE, in his paper on ore deposition, refers to the zone of 'rock flowage,' at a depth where the weight of the superincumbent mass is greater than the ultimate strength of the rock. This is exemplified in common life in many solids, especially metals, which will spread laterally, or flow, if subjected to sufficient pressure. And the phenomenon is made use of in the arts of wire-drawing, tube-making, and in coinage.

ALL the Lake Superior mines make use of the tin coffee-pot-shaped lamp burning paraffin wax. The wax, which is called 'moonshine,' is kept melted by the conduction of two long copper nails passing through the wick from the flame to the body of the lamp. About every two hours the wax is replenished from the box, which each miner brings down with him. This is quickly accomplished. They are clean and much cheaper than candles, give a good light, but are rather smoky and hot when carried on the hat. The attitude of the miner toward their use is determined by custom and prejudice rather than intrinsic merit.

IF air at atmospheric pressure and 60° F. could be compressed to 100 lb. gauge-pressure and all the heat due to the work of compression taken away as fast as generated, so that the temperature during compression would remain constant, the mean effective pressure during one stroke of the air piston would be 30.2 lb. If, on the other extreme, none of the heat due to the work of compression is taken away, the mean effective pressure during the stroke will be 41.6 lb. and the terminal temperature will reach 485° F. As the power required for compression is directly proportional to the mean effective pressure, it will be seen that the additional power required in the latter case is 37½% of that in the former. In practice neither extreme can be reached, for it is impossible to completely cool the air during compression, and, on the other hand, some of the heat of compression will be radiated; but the lower extreme is the ideal, and the nearer it can be approached the more economical will be the work done.

REPLYING to the question regarding the use of oil to be injected, together with air, through the tuyeres into the blast-furnace, an experienced metallurgist states: "It would appear that if its combustion takes place as it enters the glowing coals, then, while heat would be evolved as result of such combustion, at the same time an exhausted atmosphere or mixture of fouled gases would be present quite unsuited to burning the coke. I have taken air, heated by the burning of oil, and have blown it through the tuyeres only to see it extinguish, instead of burning, the solid fuel, all because of the contained exhausted CO_2 gas there present. It may be exemplified by those cases where the foul air of an unventilated mine will hardly support the combustion of a candle. For intense combustion of solid fuel, the air, while it may be hot, must be fresh, and, even in such cases and with the large furnaces, active combustion ends by the time the air has penetrated the glowing fuel about three feet. After that, as the CO_2 becomes reduced to carbon monoxide, the reaction is endothermic."

THE work performed by an air compressor is that of increasing the pressure by reducing its volume or compressing it into smaller space. Usually the initial pressure is the 'atmospheric pressure' at the compressor, while the terminal pressure is fixed by the requirements of each case, and may be anywhere from 10 to 30 lb. (gauge pressure) per square inch, as in blowing engine practice, up to 80 to 100 lb. per sq. in. for rock-drills, pneumatic tools, etc., and up to 1,500 to 2,000 lb. per sq. in., or even higher, for special purposes. Compressors that work against pressures under 30 lb. gauge are usually called blowing-engines. Atmospheric pressure (or zero gauge pressure) equals 14.7 lb. absolute pressure per square inch at sea-level (equivalent to 30-in. barometer), and becomes less as the altitude above sea-level increases, the decrease being approximately one-half pound, or one inch in mercury column, for each 1,000 ft. increase in altitude. As the work of compression depends upon the initial and terminal absolute pressures (absolute pressure being equivalent to gauge pressure plus atmospheric pressure), the altitude at which the compressor is to work is of great importance and should always be taken into consideration.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Blast-Furnace vs. Reverberatory.

The Editor:

Sir—Answering the twelve questions brought forward by Mr. J. W. Neill, I beg to offer the following:

1. *On what should the choice of furnace type be principally based? Choice of ore, fuel, fluxes, building materials?*

The choice of furnace should be based on the physical as well as the chemical structure of the ore. For instance, a heavy pyrite ore may be so fine that it would be folly to treat it in the blast-furnace, even though it carried an excess of Fe and S, as the flue-dust made would be so great that it would have to be briquetted before it could be retreated in the blast-furnace. The most sensible method would be to screen the ore first, and smelt the coarse ore in blast-furnaces, then roast the fine in mechanical roasters and smelt the calcine and flue-dust in reverberatory furnaces. This would require both types of furnaces. It has been my experience that a mixed plant has more advantages than a plant with only one type of furnace. However, there are several single-type plants operating very successfully in the West. For a variety of custom ores it will generally require both types, but several different grades of ores from the company's own mines may be treated economically in the one type only, owing to the local conditions, namely, cheap coal for reverberatory furnaces and cheap coke and flux for blast-furnaces.

The reverberatory would seem to have an advantage in many localities over the blast-furnace, as coal, oil, and wood can be used. However, the first is preferable where coke is the chief fuel on the blast-furnace, unless the natural fuel (FeS_2) in the ore itself can be used pyritically.

Lime is a constant drain on the metal, especially in the blast-furnace, as the percentage will usually range from 15 to 25% in the slag, and if a barren iron ore is used it will figure against the recoveries in the same proportion. In the blast-furnace, in Utah and Montana practice, the amount of slag produced will approximate the ore charged, the volatile constituents and matte will almost equal the flux used, while in the reverberatory the slag produced will not be over 60% of the original ore. So, if we assume 2% Cu ore smelted either way, with 0.25% Cu in the slag, the recovery would be 87% in the blast, and 91% in the reverberatory. However, it is usually cheaper to furnish the fluxes for fast driving than to do without them and run slow with a much higher loss per ton of slag made. If one has converter slag, it will usually eliminate the iron ore and furnish its own values. It should always carry a high percentage of excess Fe, and if the converter linings are properly dried, this is easily done.

Steel buildings should be used by all means for the smelting and roasting-furnaces, also the crane and converter building, brick for the engine-room and power buildings, because it is warm in winter, and can be made cool in the summer. The shops, ore-bins, and sampling-mill, can be built of wood, and should be placed far enough away from the main buildings for safety. Steel water-jackets are best for copper blast-furnaces, and the brick top should go through the roof, so that the downtake cannot radiate heat on the workmen. I always use the best silica and clay brick in the market for reverberatory-furnace work. They are the cheapest in the long run. A modern furnace will run about one year before repairs begin. Buck-stays cannot be made too strong. I would not use any material for the bottom with less than 90% SiO_2, unless it is high in Al_2O_3.

2. *What are the comparative costs per ton of daily capacity of each type of furnace?* (In the case of the reverberatory, this cost should include the expense of the necessary roasting plant.)

While I think the roasting cost should be charged to the reverberatory cost of smelting, still, the reverberatory should get credit for treating the flue-dust made by the blast-furnace and converters, by charging back the reverberatory cost per ton according to the amount of dust recovered from them. For example: Supposing both furnaces were running on equal tonnages of say 150 tons each, which was the case at Butte, and the reverberatory furnace was smelting 15 tons, or 10% of the charge flue-dust made by the blast-furnace. To give each type credit for actual smelting, we would proceed thus:

Blast-furnace	150 tons ore	at $3.85	per ton
Blast flue-dust made and smelted in the reverberatory	15 "	" 0.36	"
Total cost		$4.21	"
Reverberatory furnace	135 "	calcine	
Blast flue-dust	15 "		
Total charge	150 tons	at $3.65	"
Interest on 200 tons matte		0.05	
Charge roasting cost at		0.50	"
		$4.20	

I have made no interest charge on the blast-furnace, as it would be too small to consider. There is still another credit due the reverberatory, which is not shown, and that is the horse-power developed by the boilers attached. This should easily offset the roasting cost. I do not think wet concentration or converting should be charged to either type of smelting, as the product is treated in both. The coarse concentrate, slime, and some fine concentrate are treated in blast-furnaces, while all the fine should go to the roasters, and then smelted in the reverberatory furnaces.

3. *What is the comparative space requirement for an equal tonnage?*

Just figuring on the buildings to properly house each type of furnace and allow proper working room, I would say 33.3% less space is required for a blast-furnace of equal tonnage than for a reverberatory with boilers attached.

4. *What is the comparative cost of mechanical equipment for equal tonnages?*

I understand this question to mean in the case of blast-furnaces, the blowers, steam-engines, motors (electrical), bricking plant, etc., and in the case of reverberatories, the blowers, if used, steam-engines, boilers, motors (electrical) and mechanically operated roasters, the latter being the large item.

To build an up-to-date plant of say 1,000 tons daily capacity, 500 tons to be treated in blast-furnaces, and 500 tons in reverberatories, the mechanical equipment for the blast-furnace will be about 75% of that necessary for the reverberatory. I wish to repeat again, under this head, that it is not proper to charge the mechanical equipment of a wet concentrating plant to either type, neither is it proper to charge the converting equipment. Many of our sulphides require no concentrating, and it will pay some smelters to sell their matte and not convert themselves.

5. *What are the comparative costs of power, labor, fuel, and repairs?*

An up-to-date reverberatory furnace, with boilers properly attached, should develop power beside that required to operate the roasters, drive the fans (if forced draft is used), and to make electric power to operate the motors for ore and slag-haulage. This may sound overdrawn to many, but I venture the prediction that it will not be long before one reverberatory furnace, burning 50

tons of coal per day (24 hours) will develop more horsepower than will be required to operate the engines, motors, calciners, etc. The power for a reverberatory plant was 40% that of a blast plant at Butte, and in Utah the boilers on one reverberatory furnace develop three times as much power as the blowers, roasters, and slag-haulage require. This is being done at the Bingham Consolidated smelter in Salt Lake valley. At Butte labor for blast smelting was 90% of the reverberatory. With slack coal at $4 and coke at $9 per ton, blast smelting was 92% of reverberatory practice. The repairs, after the first year's run on the reverberatory, will be much higher than on the blast. Figuring labor and material, it will be from 75 to 100% higher than the blast-furnace.

6. *What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity, or of output?*

The tied-up capital will be interest on the values in the matte held in the blast-furnace fore-hearth and crucible, and the vast amount held in the reverberatory hearth. There are usually about 20 tons of matte tied up in the blast-furnace, and about 200 tons in the reverberatory, of 150 tons each. In the case of blast smelting, the interest would be too small to mention, while on the reverberatory it will seldom affect the cost to exceed $0.05 per ton. There should be an interest gain by the amount of matte tied up in the reverberatory, as it aids the smelting. In other words, it is the key to fast smelting. In the blast, it does not affect the smelting.

7. *What are the limiting necessities in the way of fuel for each type?*

Coke for blast-furnaces with not over 15% ash. However, we are compelled to use a much higher ash many times. I have used to good advantage a mixture of coke carrying from 10 to 27% ash, but I cannot recommend it. For reverberatory smelting a bituminous coal, with long flame (such as the Rock Springs, Wyo., product), is preferable in Utah and Montana. The coal should determine the length of furnace to build. It is good practice to build the fire-box too large, as it will be easier to make it smaller than to enlarge it. Oil is in the experimental stage yet. Wood is a thing of the past in the West, and could not be used in our large furnaces of today.

8. *What are the comparative losses in slag, dust, or middle products?*

While the losses in both types is comparatively the same according to the natural slag-making elements, the difference is quite in favor of the reverberatory, owing to the vast amount of barren lime and iron used in the blast-furnace charge. There will be comparatively no loss in flue-dust or middle products, when we are allowed to build proper dust-chambers, flues, and stacks, which has not been done in the United States yet, and I cannot find words strong enough to say that the interest on these three investments is the best of the whole plant.

9. *What are the defining limits of each type in regard to slag composition?*

In Butte I was compelled to run on a very silicious slag on both the blast and reverberatory, but I do not think it good practice to have the SiO_2 over 45% on the blast-furnace. One can run on a much higher silicia in the reverberatory furnace than in the blast. It is not necessary to combine all the SiO_2 in the reverberatory, while it is desirable to do so in the blast-furnace.

At Butte, blast-furnace slag usually ran about 46% SiO_2, 26% Fe, 16% CaO, and about 0.3% Cu. The reverberatory slag usually ran 50% SiO_2, 30% Fe, 5% CaO, and about 0.4% Cu.

10. *How do these differences in slag figure out in financial margins per ton smelted?*

Making the same grade of matte, the blast slag will usually carry less values than the reverberatory, but this is more than made up by the greater amount of slag made, due to the addition of barren flux. The main difference in the composition between the two slags in the Butte district is in the lime content, so considering only the slag, the blast is the more costly to make.

11. *What method of charging do you advocate for a copper furnace (assuming the atmosphere to be oxidizing)?*

By all means employ side-dump cars, of which there are many excellent types for blast-furnace charging, and hoppers for reverberatory furnaces, set in such a position as to spread the charge properly.

12. *Would you bind, in some manner, all fine for use in the blast-furnace? Incidentally, what are the difficulties of treating fine ore in the blast-furnace?*

I would not bind any fine ore that could be treated in a reverberatory furnace. I have seen only one good binder; that was slime, made from wet concentration on Butte ore. The difficulties of treating fine ore in a blast-furnace are too well-known to need much comment: First, it limits one to the amount of wind necessary for fast driving; second, too much flue-dust is made; third, it forms dead spots in the ore-column, as well as crusts on the sides and ends of the furnace walls; fourth and last, it creates kicks from the farmers that can be heard from one side of the continent to the other.

It is gratifying to the writer to note the interest taken nowadays in the reverberatory practice. It was only a few years ago that I can recall a class of students visiting a smelting plant where I was employed in Montana, and the superintendent boldly told those young men that the reverberatory furnace was a thing of the past, and he would not build another one of them, under any consideration. Let the old, as well as the younger men in the business, weigh well all the above questions, before deciding on either type. It will no doubt appear to many of our friends that I have favored the reverberatory furnace in my answers. Such is not so; having practiced with both types for over twenty years, in the West, I fully realize the worth of both.

On Butte ores, I would treat 60% of the ore in blast-furnaces, and 40% in the reverberatory. On the sulphides in this district, I would treat 75% of the ore in reverberatory furnaces, and 25% in blast-furnaces. However, it can all be treated successfully in a complete reverberatory plant, owing to its fineness.

HARRY L. CHARLES.

Salt Lake, December 25.

Individual Stamps.

The Editor:

Sir — In response to Mr. Bosqui's inquiry, I can contribute the following experience with this type of stamps. The mill in question is of 18 individual quadruple-discharge stamps of a well-known maker, driven by three cam-shafts having the bull wheels in the middle, with a set of three stamps on each side. The mortars of each set of three stamps are cast as one solid casting, with tops and bottoms together, and occupy one base; this arrangement is similar to, and takes the same space as, one five-stamp battery.

The inventor recommends his own feeder, the usual square hopper tapering down, which delivers into a shaking chute actuated by an arm struck by a feed-tappet on the stem. These feeders work fairly well on dry coarse ore, but as a large part of that being treated is a fine oxidized material, more or less wet, it sticks at the bottom of hopper and the shaking chute packs it, cutting off the feed; one man is constantly poking the

feeders open, and it is hard to get a man who can keep the stamps from pounding. A five-stamp Challenge would feed this ore without trouble, but it is questionable if an individual Challenge would do so, on account of the smallness of the hopper-bottom that delivers to the revolving plate. A disadvantage of individual feeders and mortars is that ore must be crushed very fine, whereas in a large mill of the old style, during a breakdown of the rock-breaker, I have seen ore sent through with little trouble that ran up into occasional slabs 4 by 10 by 16 inches.

The placing of the bull wheel in the middle of the cam-shaft gives smoother running and less pounding of end boxes, but it has been found impossible to keep the bull wheel keyed tight to the cam-shaft. As contact parts are hidden by the battery-posts, the looseness is not apparent at first, and to key it again is quite a job; often the stamps have to be inclined out and the shaft raised. As such trouble will occur in most mills, it is advisable to place the bull wheels at the end of the shaft as usual.

The stamps weigh 1,250 lb., dropping 130 times per min. when set at 5¼ in. This is an unnecessarily heavy stamp for a soft or friable ore. The manufacturers of individual stamps advise extra heavy stamps with a fast, and consequently short, drop. The fast drop is absolutely necessary to get capacity by keeping the pulp moving over the screen surface, but this fast drop tears the battery parts and frame to pieces. With the old-style battery, careful experiments in many representative mills has demonstrated that the weight of the stamps and the rapidity of drop can be carried too far.

One trouble has been that the mortars fill up and have to be dug out; this occurs largely with soft fine ore, and to some extent with hard ore, even with the most careful feeding. It is impossible by any practical means to keep an even height of discharge, and it is not attempted; consequently, when new dies are put in there is a tremendous wear and tear on screens, as there is at all times. With 72 screens to look after, one-third of which can hardly be inspected, the conscientious millman has the time of his life.

In feeding a mixed ore the discharge is uneven, which is due to the feeder and mortar, the soft ore coming through first, the hard ore following. This does not occur in the old style with careful feeding. To get capacity with the individual stamp it is necessary to use an enormous amount of water; this swamps the plates, unless there is a special arrangement. At this mill, two sets of parallel plates are used to each three stamps, but it is impossible to get such an even flow as where plates are the full mortar-width and directly in front. There is little opportunity in a practical way to put a strip down the middle of a plate and rub up without turning off some of the water entering the battery and turning the pulp down one-half the plate, as is customary on low-grade and largely concentrating propositions. Inside feeding of quicksilver was not a success, and as plates cannot be kept in as good a condition by outside feeding, many dressings are required, and rubbing 12 plates for 18 stamps is stretching it.

Undoubtedly one individual stamp requires almost as much attention as a five-stamp battery. It might be advisable to increase the number up to 12 stamps; there are old-style mills in which one man runs 60 stamps. The advantages of the individual stamp are a larger capacity and fewer slimes, but the gain is much less than is usually supposed. As we either treat our slimes or run them to waste, the slight increase with the old style is usually of little consequence in comparison to the other advantages. Coming to capacity, in the old-style battery there are 500 pulsations given the pulp in the mortar per minute, naturally the finer and slimier material is kept in suspension to be washed through the screen, while the coarser remains to be crushed. In the individual, there are only one-fourth the pulsations and they are more violent — to the detriment of the screens. During the interval of drop the sand settles down on the die, the water is first forced out, if there is much height of discharge; then the sand is mashed and hurtled through the screens. In comparing the two styles, study the mortar action. If it is large screen-area we want, why are so many double-discharge mortars working with their back closed up?

If you want capacity it will pay to put up a greater number of five-stamp batteries than to put in individual stamps. The extra cost will only be for battery parts and power; 30 stamps could be put on the foundations of our 18 individual stamps. Figure out how many extra stamps the less cost for labor and screens, and loss of time putting in screens, minus the actual increased cost for power, over a period of one year, will put in. And remember, in the five-stamp battery you have a machine that is practically never replaced entirely by some other machine, but has replaced every other machine built for the same purpose. Ask the millman of experience with both types who knows the average milling conditions. Millmen have come to take a shift on this mill, and refused to go to work on seeing it.

In regard to the large individual stamp-mill — for concentration only — now being erected in Utah, the ore is a medium soft porphyry seamed with rotten quartz in which copper sulphides lie. As it is an ideal wet crushing ore, easily disintegrating, it is no wonder a high stamp duty — 10 tons through 28 mesh — was obtained in the experimental mill. For this particular ore the type of stamp selected is undoubtedly the best. It remains to be seen whether a stamp-mill crushing to the maximum fineness in one operation or the usual concentrator of rolls, grinding mills, jigs, etc., crushing and sizing in stages should be used on this ore. A mill of this type is being erected alongside the stamp-mill to run on ore from the same deposit, and the comparative results are awaited with great interest.

AMALGAMATOR.

Salt Lake, January 4.

A Notable Subscriber.

As a rule we do not burden our readers with the recital of complimentary letters from our friends, but the accompanying communication seems to afford excuse for making an exception. Mr. Corbett became a subscriber on November 27, 1871, and we have taken care that he shall get the paper in the future. His letter follows:

ASHLAND, Oregon, Jan. 15, 1907.

MINING AND SCIENTIFIC PRESS,
Berkeley, California.

Dear Sirs — After 35 years of close companionship we come to the parting of the way, and feel that I at last must drop your valuable magazine, the MINING AND SCIENTIFIC PRESS. I much regret this necessity. I am very near my 81st birthday, and last summer I disposed of the most valuable set of engineering instruments to be found on the Coast.

I began practice February 1, 1857, at Snow Point, Nevada county, California; went home in 1861 to aid our Uncle Samuel; went to Montana in 1864, staying there 29 years; then to Oregon, 1893, and am here yet.

Wishing you unbounded success,

Very respectfully,

J. LESLIE CORBETT.

First subscription, Nov. 27, 1871.

Some Associations of Gold With Pyrite and Tellurides.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. SHARWOOD.

Two recent contributions* to the MINING AND SCIENTIFIC PRESS have referred to the relations between gold and pyrite in quartz veins. The accompanying drawings and notes illustrate some other occurrences of the kind.

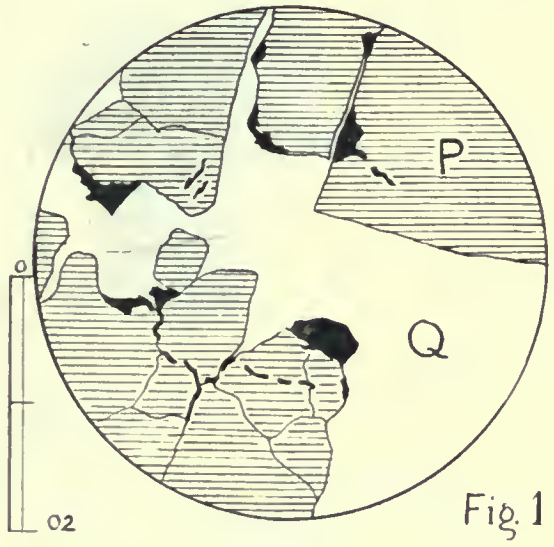


Fig. 1

When auriferous pyrite is graded by sifting, and the different sizes are assayed, two results may be observed: Either (1) the pyrite in the coarser portions differs but little from that in the fine, as regards gold value, which in this case is usually low, or (2) the value of the fine and coarse differ considerably. In the latter case my experience has been (excluding occurrences of very coarse gold) that the finer grades are invariably the richer.

This condition, of course, agrees with Mr. Smyth's results, and with his inference that the gold resides chiefly at or near the surface of the sulphide. For, if the pyrite grains have not been broken down, the finer particles necessarily present the greatest surface in proportion to their weight; while if crushed in a mill or mortar the surface material contributes first to the fines.

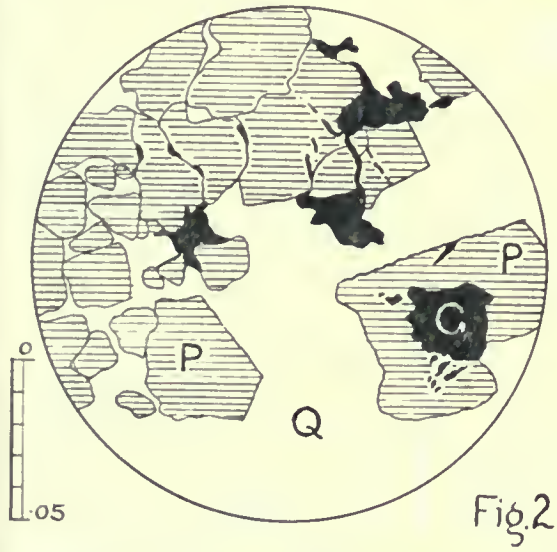


Fig. 2

Microscopic examination of a large number of specimens containing pyrite and visible gold in juxtaposition further confirms this view, and the drawings illustrate some of the conditions observed. In all cases thus tested at least some of the gold was found to be either at the surface of the particles of pyrite, or at a very small distance outside them, or else deposited in minute cracks in the pyrite. No grains of gold were found entirely enclosed in solid pyrite; in some sections gold particles were apparently surrounded by it, but examination during the grinding of the slides showed that these all extended to the surface of the pyrite grains or communicated with cracks. Of the specimens illustrated only one (Fig. 7) shows any trace of oxidization.

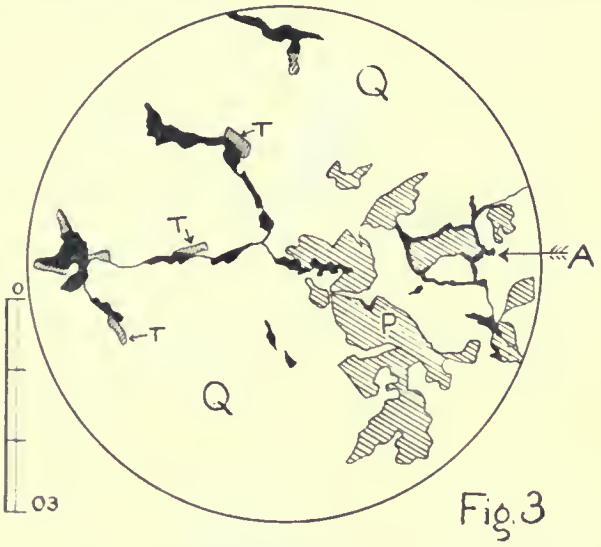


Fig. 3

DESCRIPTION OF SECTIONS.

The scale divisions are in every case hundredths of an inch; black areas represent gold.

Fig. 1 and 2.* Keltz mine, south fork of Stanislaus river, Tuolumne county, California. Quartz and pyrite, with gold (about 850 fine), and occasional specks of undetermined telluride. The pyrite is fractured, not appreciably oxidized, and the gold is at its surface or scattered along minute cracks. The thinnest sheet of gold accurately measured was 0.00015 in. thick, others were probably as little as 0.00005 in., the apparent thickness being increased by the grinding and polishing of the microscope slides.

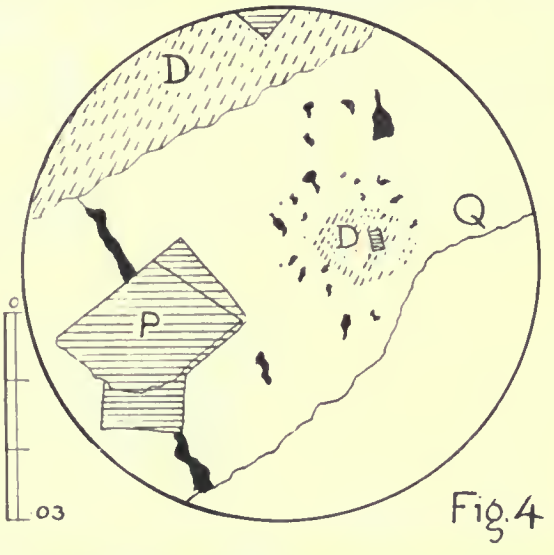


Fig. 4

This vein fills a fissure in carbonaceous slate, and is usually accompanied by a narrow altered porphyry dike carrying small cubes of pyrite containing only a trace of gold. The vein and walls show evidence of great pressure and repeated re-opening. In parts the quartz is

*H. L. Smyth, July 14, 1906; W. Lindgren, August 15, 1906.

*The veins yielding the ores shown in Fig. 1 to 5 closely resemble some of the Grass Valley veins, both in structure and mineral contents. Fig. 1 especially may be compared with Lindgren's illustration of ore from the Omaha mine (17th Ann. Rep. U. S. Geol. Survey, Vol. II, plate V), which is reproduced in Spurr's 'Geology Applied to Mining,' page 300.

ribboned or sheeted, gold being found with flattened pyrite in the dark seams. Polished black slickensides are frequent.

Fig. 3. From southerly portion of Soulsby mine, Tuolumne county, Cal. Milk-white quartz from 10-in. vein in granodiorite, with pyrite, gold (875 fine), and particles of bismuth telluride. The quartz grains are relatively large, many 0.1 and 0.12 in. across, very full of minute enclosures, which show a tendency to lie in lines or zones parallel with their length; these zones are continuous across the crystalline grains shown by the polariscope, and are independent of the crystalline structure. In this specimen the gold is all either in distinct cracks in the quartz (which usually communicate with pyrite or telluride), or is in contact with pyrite or telluride. At the point marked *A* a gold deposit entirely surrounds a grain of pyrite and another of quartz. After amalgamation the residual pyrite retains very little gold.

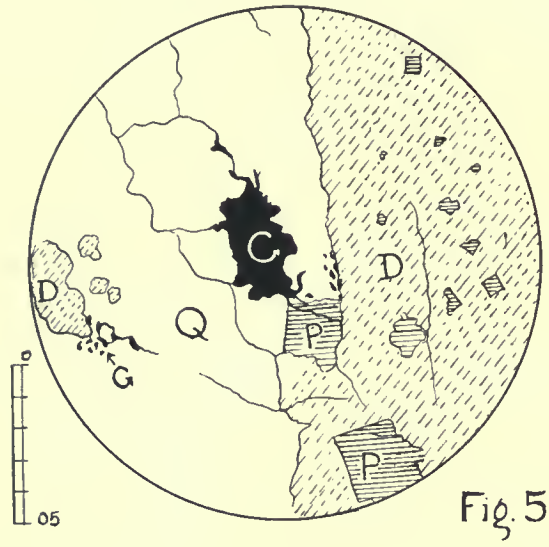


Fig. 5

In other parts of this deposit gold is found associated also with pyrrhotite, copper pyrite, zinc blende, and galena.

Fig. 4. South end of Soulsby mine. Gold and cubic pyrite in a ¾-in. stringer of compact white quartz, running through a dike of 'black slate' (*D* in figure; probably a sheared diorite-porphyry*). A large flake of gold occurs in a crack in contact with a pyrite crystal; smaller irregular particles surround decomposed fragments of pyritic 'slate.'

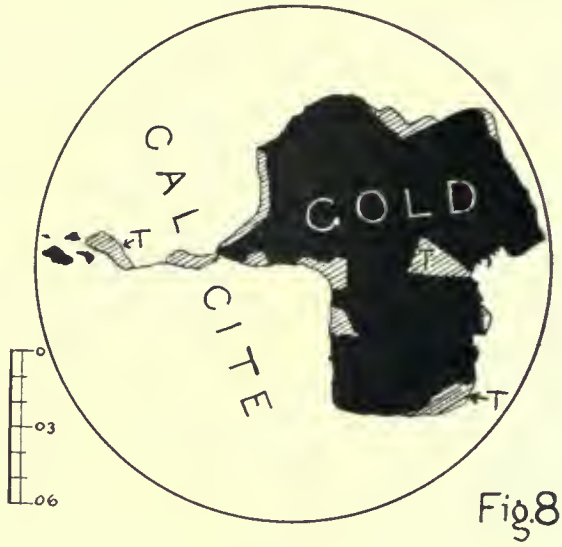


Fig. 8

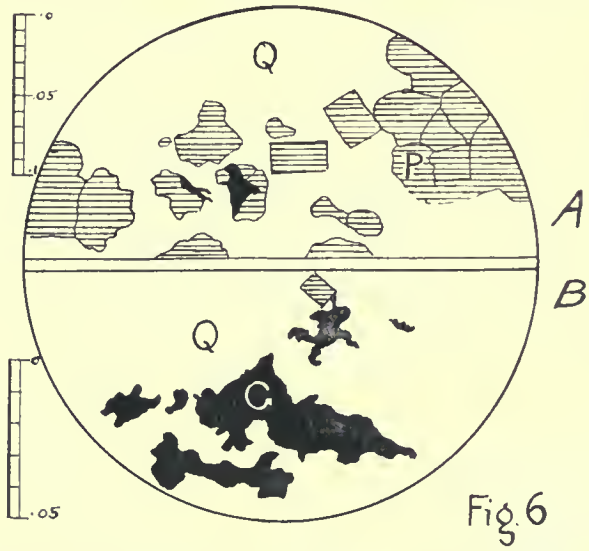


Fig. 6

Fig. 5. Same locality as No. 4. This shows a more usual condition in the veinlets which seam the silicified 'black slate' dike at this point; gold having developed in the quartz (which is free from pyrite) in the immediate vicinity of pyrite which has developed in the 'slate' (*D*), this pyrite being itself very poor in gold.

Fig. 6. From Hashidate mine, Echigo, Japan. Gold in white quartz, in some portions accompanied by pyrite. Most of the gold is, however, in masses in white quartz. Two sections shown were cut from the same specimen, at a few inches distance from one another.

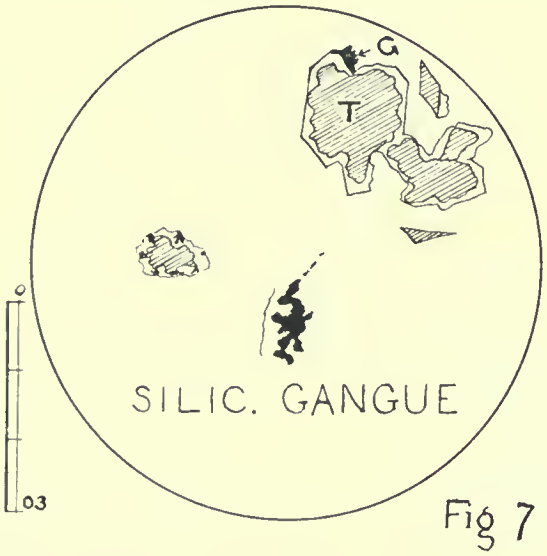


Fig 7

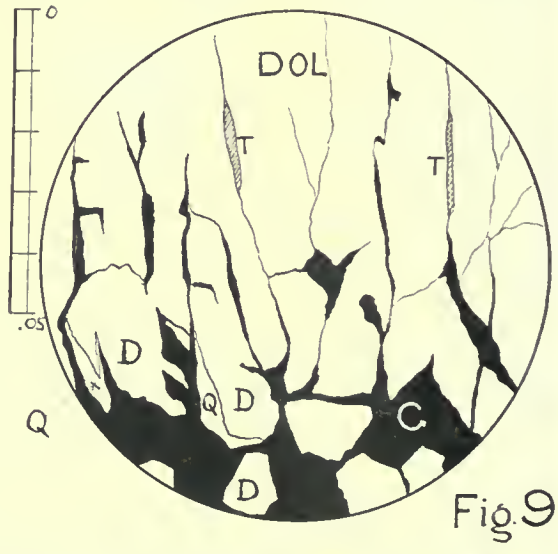


Fig. 9

Fig. 7. Gold and scattered grains of bismuth telluride, occurring in a much altered feldspathic rock, from the vicinity of Quigley, Montana. The very rich portions of

*F. L. Ransome, 17th Ann. Rep., U. S. Geol. Survey, Vol. I, page 677.

the deposit are hard and silicified masses, imbedded in a soft, clayey material which is poor in gold; both evidently resulting from alteration of a dike rock. All the gold is free, about 870 fine, and readily amalgamable; the telluride grains contain no gold or silver but are much corroded and superficially oxidized. A few small grains of oxide of iron are present, apparently due to oxidation of pyrite; these (not shown in figure) also carry free gold.

Fig. 8. Cable mine, Montana. Coarse gold with bismuth telluride in calcite; the telluride is mostly found surrounding masses of gold or in cracks in the calcite, but some crystals are enclosed in gold.

Pyritic ore of lower grade occurs in the same deposit accompanied by dolomite. The deposit is associated with a black intrusive rock, specimens of which were found to consist of olivine and magnetite in about equal proportions.**

Fig. 9. Jumper mine, on Mother Lode, Tuolumne county, Cal. Part of cross-section of veinlet or stringer of gold and dolomite in a dark pyritic slate. The pyrite in this slate is of very low gold value. The dolomite veinlet itself is from ½ to ¾ in. across, and contains a very small amount of an undetermined telluride, about 5% of

Fig 10

quartz, and from 3 to 10% by weight of gold (867 fine), though the appearance when broken indicates much more, owing to the toughness of the gold flakes, which fill the spaces between the dolomite crystals and completely surround some of the grains. Some of these flakes are much less than 0.0001 in. thick, and readily float in water when the carbonate is removed by acid.

The order of deposition is apparently: Dolomite, telluride, followed by gold and quartz.

Fig. 10 shows a less magnified complete cross-section of the same stringer.

Fig. 11. Sections across branches of a crystalline intergrowth of free gold and lead telluride (altaite) from Birney pocket-mine, Sawmill Flat, near Columbia, Cal. This was cut by imbedding the specimen in melted sealing-wax and grinding off a face. The altaite is nearly pure lead telluride, containing no combined gold. It and the free gold, which is 920 fine, appear to have been deposited at the same time. Both show crystal faces of cube, octahedron, etc.

In the ores represented by Fig. 1, 2, 3, and 6A gold has apparently been precipitated from solutions by contact with the pyrite, though no corrosion of that mineral is perceptible, and the quartz shows no iron stains whatever. Fig. 4 and 5 suggest deposition by the influence of the pyrite, but at a short distance from the precipitant, either by electrolytic action or as a secondary effect—possibly by hydrogen sulphide or ferrous sulphate resulting from the action of an acid solution, or of oxidation, on the iron sulphide, though in this case again no evidence of oxidation can be seen. In Fig. 7 we have precipitation of gold accompanied by the oxidation of a barren telluride. In Fig. 11 gold and a barren telluride of lead seem to have been deposited simultaneously or alternately by the same agency, but there is no evidence as to what the agent may be. In Fig. 8 the same conditions may hold. In the latter specimen, however, it is possible that the telluride may have been the precipitating agent; the grains of bismuth telluride were too small to determine positively whether they carried any combined gold, but if so, the percentage must be very small.

The above instances of gold-tellurium ores must be distinguished from true gold tellurides, such as the calaverite and sylvanite found in certain localities in California, Colorado, and Western Australia, in which the gold is or has been actually combined with tellurium. On the oxidation of such minerals the gold is set free, but frequently in a porous or finely divided condition.

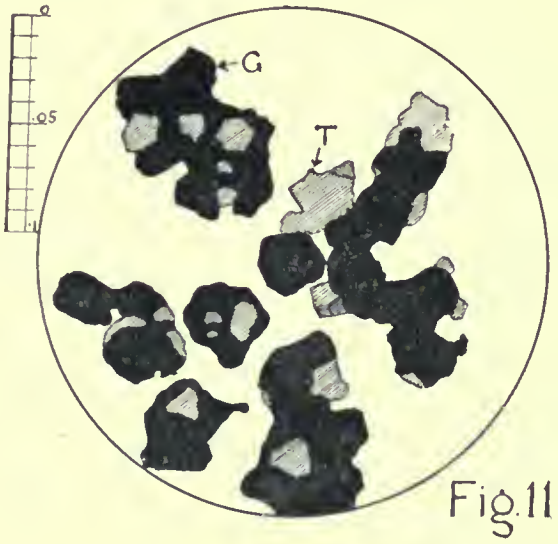


Fig.11

Laboratory experiments with pure minerals and preparations showed that the sulphides and tellurides of bismuth and lead, as well as the various minerals known as 'pyrites,' are very active in precipitating gold from its solutions—both acid, neutral, and alkaline. In general, the acid and neutral solutions gave deposits more brilliant and 'metallic' than the alkaline, which were often brown and more or less spongy. Pyrite cubes, and other minerals containing iron, commonly gave irregular deposits, the gold growing from a few scattered spots; the lead and bismuth minerals, on the other hand, usually became gold-plated over the entire surface soon after they were immersed in the gold solutions, if these were acid or neutral in reaction, and were more rapid precipitants than pyrites. Pure zinc-blende precipitated gold with extreme slowness but impure specimens were more effective.

MOISSAN has found that, at its boiling point, copper dissolves graphite, and, upon cooling, the graphite is given out again in the form of more or less well-defined crystals. This fact may explain the small black specks occasionally found in the fracture of brass castings. At the usual brass-melting temperature there is, undoubtedly, little absorption, but in over-heated metal it may be possible that the dissolved graphite plays a more important part in weakening copper and its alloys than is usually supposed.

**Described by W. D. Bohm as magnetite, *Mining Magazine*, May, 1906.

Mining Conditions at Ely, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By EDWARD W. RALPH.

Anyone who has lived for any length of time in the West or has come in contact with old-time Westerners in any part of the world has heard of the White Pine excitement in eastern Nevada in the late sixties. Gold was discovered in White Pine county at that time, and hundreds of men, having had their cupidity aroused by the various excitements and rushes which had been taking place on the Pacific slope with more or less frequency from '48 to the discovery of the Comstock, years after, were unable to restrain themselves when the word was passsed that there was gold in White Pine. Stories of wealth to be gained and sudden fortune to be acquired appeal to everyone. True, everyone does not rush to new 'diggings' at the first rumor of discovery, but the majority of the old-timers were found in almost every rush, provided the rumors regarding it were sufficiently persistent and elaborately embellished in detail.

Thus it was in the White Pine rush. The magic words 'gold in White Pine' was the slogan that caused otherwise level-headed men to drop the 'bird in the hand' to wander, aye, and to suffer, in search of the mythical 'two in the bush.'

As near as we can learn, in regard to White Pine, however, the prizes were miserably small and few in number. There was gold, it is true, but in such meagre quantities that it neither warranted an excitement nor maintained a camp of any consequence after the rush was over.

The town of Ely came into existence about this time, and managed to maintain a precarious existence, partly due to its situation, on the edge of the Steptoe valley where a little ranching was carried on, and partly because it was a supply point for the few miners who had the hardihood to stay with White Pine, and hold on to the claims they had located, hoping that some day they would become valuable. Monuments to the enterprise and tenacity of these pioneers are still in evidence in the form of mills and kindred reduction plants that bear silent witness to the grit of these old-timers, who had the courage of their convictions, however mis-applied and ill-directed their efforts were.

Gold was the much-sought metal then; if the mines would not pay as gold producers, it was argued, they would not pay at all. Copper was recognized as being present, but its very presence was cursed as being a great evil and detrimental to the recovery of the precious metal. Mills and concentrators were erected, tried out, found wanting, and abandoned, and finally all hope of making White Pine a paying mining district appears to have been abandoned and the camp relapsed into that condition described by Mr. Cleveland as "inocuous desuetude."

A few years ago the attention of several experienced mining men was directed to the district in the hope that, with the healthy tone of the copper market and the large area of available ground, it might be found commercially profitable to work the ores on a large scale. Work was commenced and vigorously prosecuted on the present holdings of the Nevada Consolidated and Giroux companies, with a view to ascertaining the exact extent and assay-value of the orebodies known to exist. An experimental reduction plant was erected on the Ruth mine and work was pushed vigorously underground. Developments in this and adjacent mines showed that the orebodies were of such prodigious proportions as to stand without a parallel among sulphide copper deposits.

The Nevada Consolidated people have now connected the town of Ely with the Southern Pacific railway at Cobre (a station 135 miles west of Ogden) by a standard-gauge railway 150 miles long. This road is now being extended from Ely, through Robinson cañon, to the mines of the company.

It is stated that a large smelter is to be built to treat the ores of this company, but nothing tangible in this direction is, as yet, in evidence. The Giroux company has a 100-ton smelter built and the Taylor Engineering Works is now building a 500-ton concentrator for this company. The Giroux people are working five shafts, the ore being placed on the dump to await reduction facilities. The extent of the copper-bearing zone already proved is about six miles long by two miles wide. West of the Giroux company's holdings are situated the mines of the Cumberland-Ely Co., now said to be absorbed by the Nevada Consolidated. Of this group of claims the Veteran mine is where most of the development has been done and the ore exposed therein appears to be of a higher copper tenor than in the mines farther east, while the real extent of the ore is unknown, although hundreds of feet of openings have already been made.

As to the geology of the district and the genesis of the mammoth copper-bearing orebodies, many different theories have been advanced. Mining men coming here with preconceived ideas relative to mines and mining as they occur in other places have been compelled to admit that it is a new one on them, and then do some thinking. The country generally, aside from where the gossan protrudes, is covered with either lime or rhyolite; the gossan is, of course, barren of copper, but has some gold in places. The copper-bearing sulphides—usually either chalcocite or chalcopyrite—occur in a quartz-porphyry matrix at a depth varying from 75 to 250 ft. below surface. The quartz-porphyry may occur with or without a paying copper content, but it seems that when pay-ore is encountered it is invariably associated with this quartz-porphyry.

Many of our regulation phrases, such as dip, strike, foot-wall, hanging wall, etc., will have to be quietly laid aside and forgotten here. As far as development up to this time indicates, none of these terms can be applied to the orebodies in question. As far as the exploration to date shows, they may be simply referred to as 'deposits', of no particular dip, and, while the proved ground would seem to show that the general trend of the ore-zone is easterly and westerly, this is simply because almost all the work done up to this time has been confined to where the gossan appears on surface.

Perhaps the ore was precipitated between the lime and rhyolite and these overlying formations subsequently eroded away, leaving the mass exposed here and there. The very immensity of the orebodies would seem to preclude the theory of fissuring and subsequent filling, and indeed no distinct fissuring can be detected except in places remote from the known orebodies. Whatever the genesis of this colossal ore-zone may have been, the fact of its existence and magnitude is plain to anyone who comes here, and of its possibilities as a future factor in copper production, there can be no question.

Just a word as to labor and business conditions: Ely can be reached either by the Nevada Northern railway from Cobre on the Southern Pacific or by stage from Eureka, the southern terminus of the Eureka & Palisade railway, about 75 miles distant. If the all-rail route is chosen, the visitor to Ely, on alighting at Cobre, is at the mercy of the Nevada Northern railway, which mulcts him in the sum of ten dollars for carrying him from there to Ely, 150 miles south. When he gets to Ely and tries to get a room and is lucky, he may find a cot at his disposal for one dollar per night. He can now get a decent meal for fifty cents, although it was but a very short while since that it was almost impossible to obtain

anything fit to eat in the town. In common with the Western country generally at present, labor is rather scarce. Good mechanics, miners, and laborers are in demand. It is very difficult to obtain the necessary supplies to carry on mining. The only sure way to get what you want is to bring it in from outside, and this takes a long time, owing to a congestion of freight on the roads. The settlement is typical of a mining camp; whatever else is wanting, there is always whisky to be had. Ely is now entering the transition stage; tents are giving way to frame buildings and shacks to more substantial structures; nice residences and office buildings are being erected and hotels of no mean pretensions are going up for the accommodation of the traveling public.

That the town of Ely is destined to occupy a place among the mining centres of note in this country, there can be no doubt, and it is to be sincerely hoped that its citizens will not, in their mad rush after wealth, overlook those matters of sanitation, a pure water supply and other things of a kindred nature, which are so essential and indispensable to a healthy, progressive, and well-ordered community.

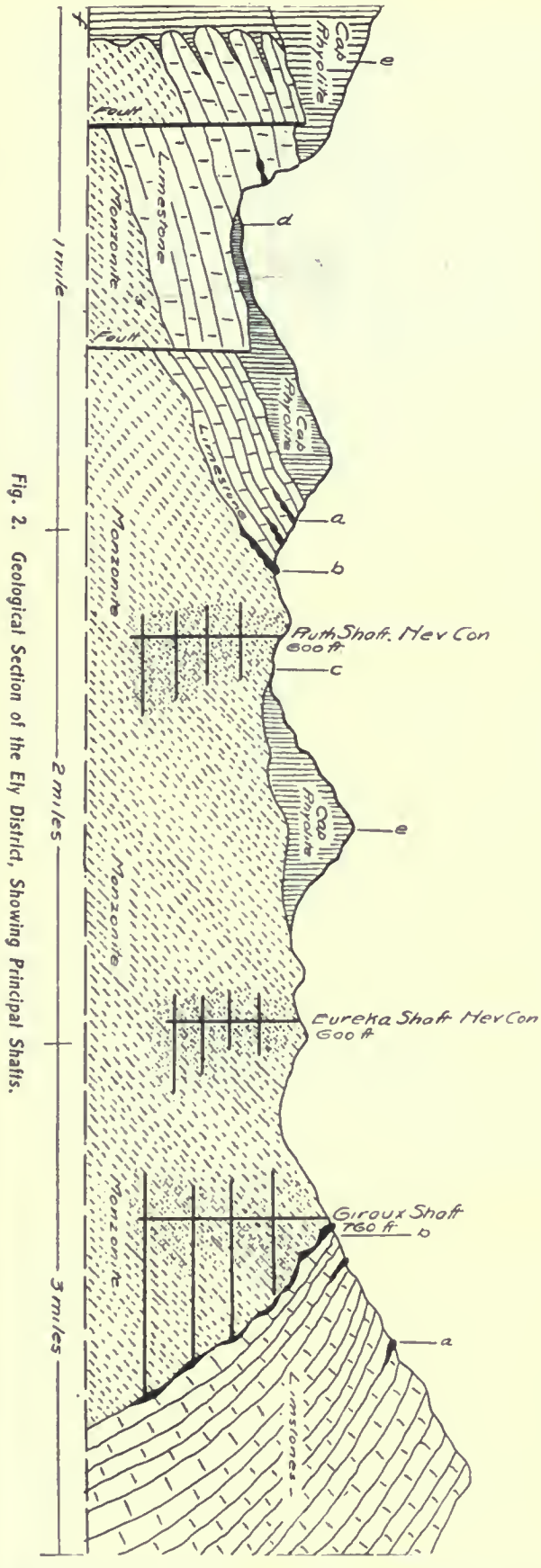


Fig. 2. Geological Section of the Ely District, Showing Principal Shafts.

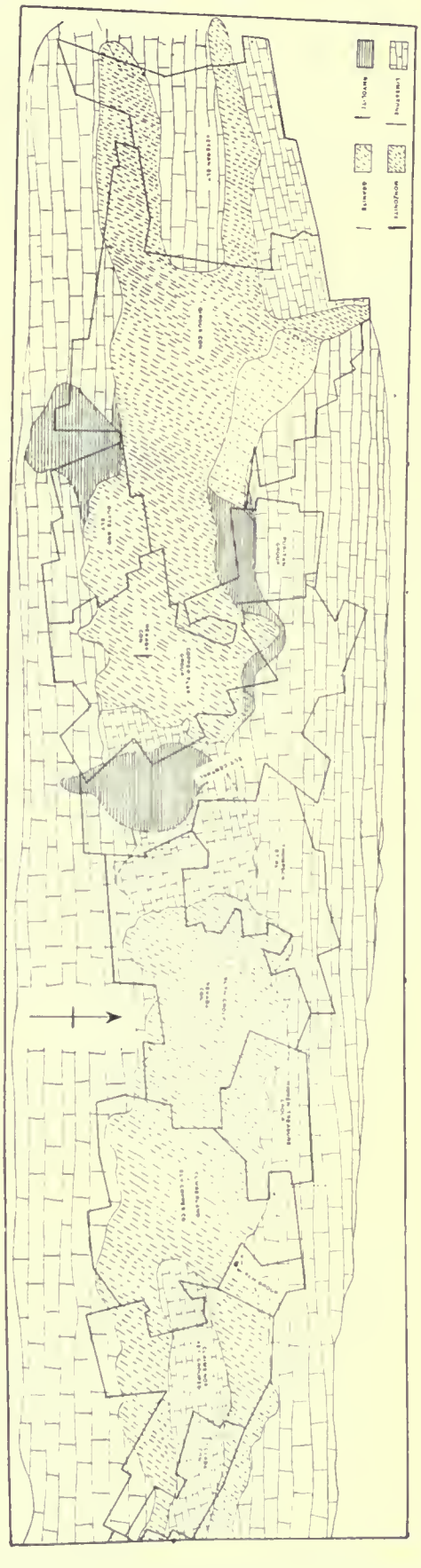


Fig. 1. Map of the Principal Properties of the Ely District.

Timber Preservatives.

One of the biggest expenses connected with mining is found in the timbers used to support the various gangways. Their destruction by decay and breaking costs many hundreds of thousands of dollars annually and in some cases the loss of human life. Mine operators are fully familiar with these facts. They know also that the seasoning and the preservative treatment of timber add to its life in service in the mine, but it has only recently been established by experiment that effective seasoning and treating with creosote, carbolinium, and zinc chloride can be secured at a cost so slight in proportion to the greatly increased life of the timbers as to effect a material saving.

In the loss of mine timbers at least 60 per cent are destroyed by decay and the remainder by crush. The percentage charged to decay should be even higher, because many of the timbers that break have already been weakened by decay.

Decay is principally caused by wood-destroying fungi. Warm, moist air, together with certain gases always found in mines, greatly favors the development of these fungi. Ventilation is an enormous factor. Timber in the vicinity of shafts and slopes where there is abundance of fresh air lasts longer than that deeper in the mines. The variation of moisture and temperature within mines is so wide that timbers may decay in eight months or may last several years. Timbers that are constantly wet or constantly dry last longer than those subjected to an alternation of these conditions.

Insects play a considerable part in the destruction of mine timbers. Many forms are found, including bark borers, ants, and timber worms. Their presence may be due to allowing logs to lie unpeeled after felling. Ants and cerambycid borers may attack props after they go into the mine. There decay spreads rapidly, and the destructive work of the insects appears to be in no way affected by the lack of light or by presence of gases. Creosote and carbolinium are effective insecticides and stop the work of the wood-borers.

The following data are based on experiments made in Pennsylvania under the direction of the Forest Service:

Various materials and methods for preservative treatment have been tried. Only time will show which are the most satisfactory from the practical point of view. Applied with a brush, creosote and carbolinium give an excellent penetration in solid wood, frequently averaging from one-fourth to one-half an inch. The amount of oil that seasoned loblolly pine takes from a brush application is surprising, especially in the end grain. Little difference in penetration has as yet been noted between creosote and carbolinium, though the latter seems better on absolutely green timber. All brush treatments were applied hot and in two coats. The second coat absorbed practically as much oil as the first.

Open-tank treatment has succeeded beyond all expectations. This consists of an immersion of the timbers for several hours in preservative and then allowing them to cool to atmospheric temperature. While the feasibility of the open-tank treatment has been demonstrated, there is much yet to be learned. The cost may be reduced by shortening the immersion and thus consuming less fluid. A heavy treatment is not necessary. The best preservatives approximately double the serviceable life of railway ties and may be counted on to do the same or better for mine timbers. Seasoned and treated props, which were put in alongside of the old-style props, unseasoned and unpeeled, are as sound as ever, while the others are already showing signs of fungous growth and decay.

Motoring in the Desert.

The antomobile is used generally all over the goldfields of the Nevada desert, in order to save time. Usually the charge for this service is $100 to $120 per day, but even the greater expense is an ultimate economy.

For example, an engineer who wanted to go to a certain locality would have been compelled to devote five days of travel if he had gone by stage-coach; by motor, it required only 11 hours of actual travel, so that he made the trip in one day comfortably.

ANNEALING STEEL.—If a piece of cast steel be allowed to cool freely from a casting temperature, there will be a grain or crystal growth proceeding to a certain point when the growth ceases. The metal in that condition will not possess its maximum ductility expressed as elongation and contraction of area. It will be more or less brittle, depending upon the carbon content. If that same piece of steel be re-heated to or about the point at which the grain growth stopped and allowed to cool slowly, the coarse grain developed during the first cooling will be greatly modified, broken up or obliterated and replaced by a finer grain than it had originally. In this new condition the ductility will be greatly improved; the metal will be tougher and better fitted for service conditions in any case than without a re-heating. Such a re-heating is, properly speaking, 'annealing.' The object, then, in annealing is to so affect the grains or crystals as to develop the maximum degree of toughness that a casting of a given composition is capable of developing.—*Iron Trade Review.*

CARNIOLA, in Austria, is a region of caverns, underground waters, and disappearing rivers. One of its most remarkable features is Lake Zirknitz, an irregularly shaped lake five miles long, whose waters disappear periodically for several weeks, or even months, at a time, during which interval the bottom is utilized for the growing of hay or other herbage. The waters are not regular in their disappearance, and have sometimes not retired during five or six years, but generally they drain off at the end of August. It takes from 20 to 25 days to empty the lake, but it re-fills suddenly and unexpectedly in as short a time as 24 hours. The phenomenon is due to the limestone character of the country, which is honeycombed by circulating waters. Numbers of fissures occur in the lake bottom, communicating with these subterranean channels, through which the waters are replenished or drawn off; 28 of these openings draw it off only, while 12 others discharge water into the lake as well as draw it off. Through the latter the water pours in after rainy weather as from a spout.

Old Mexican Methods.

Written for the MINING AND SCIENTIFIC PRESS
By BERNARD MACDONALD.

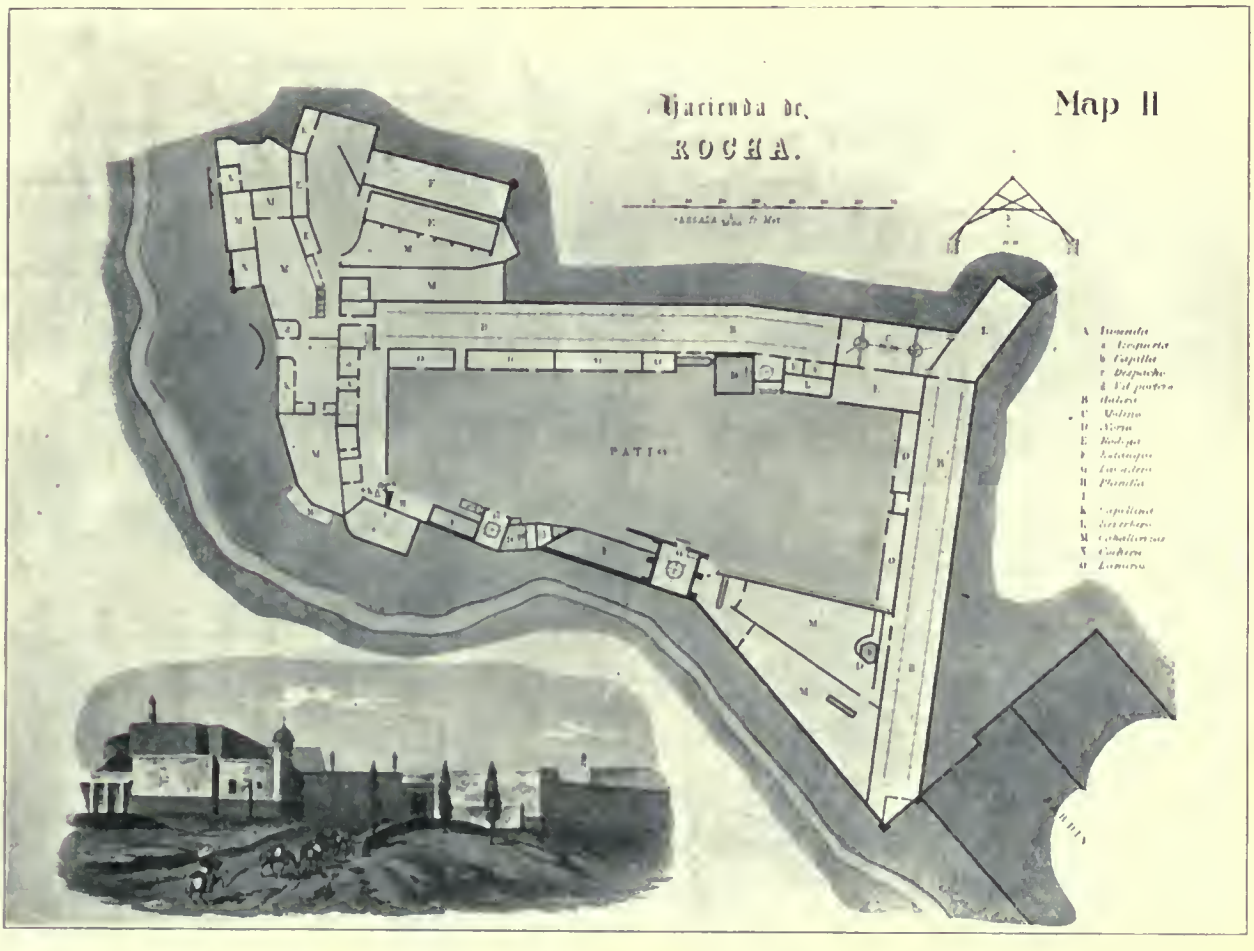
The accompanying plates were made to illustrate a report made in 1866 by Herr E. Tillmann, the Royal Commissioner of Mines in Prussia, and who had in 1865 visited Guanajuato at the instance of his own government to examine the mines of the district.

By way of introduction and historical interest to what may be said of the value of these plates, it should be known that Guanajuato was one of the first mining districts worked in Mexico after the Spanish conquest under Cortez in 1519, and that this district still holds the record of making the largest production of silver in the Republic. Owing to the enormous size of the ore deposits, rather than to the richness of the ore, the mines at Guanajuato were worked continuously, unless when temporarily interrupted by wars and revolutions, until depths ranging from 800 to 1,500 ft. were reached in the mines on the Veta Madre, or Mother Lode of the district. Then, on account of water, high treatment charges, and sundry other causes, the mines gradually became unprofitable and about '84 or some twenty-two years ago, practically all the deep mines were closed down.

In 1890 the Guanajuato Consolidated Mining and Milling Co. purchased the Sirena group of mines on the Veta Madre (See Map No. 1), this being the first American company to enter the field. It began to unwater the mines at once and afterward commenced regular mining and milling operations, substituting pan-amalgamation for the patio process. Not being satisfied with the results obtained from the treatment of their ore by pan-amalgamation, this company, in 1904, substituted for it the cyanide treatment. The results of this latter process being attended with highly favorable results, attracted the attention of American capital to the district and now all the prominent historical mines of the district are owned by American companies, and large milling plants with corresponding cyanide plants are being erected for the treatment of their ores.

From the number of mills already erected and in operation and those in course of construction, or contracted for, it is practically assured that by the middle of 1907, one thousand stamps will be dropping in the district and mining and milling will be carried on by the most modern methods. For this reason and in view of the fact that the former methods of mining and milling in vogue in Guanajuato for over 350 years will disappear forever and be replaced by modern methods, especial interest attaches to Plate No. 2 and 3 in question, giving, as they do, some idea of the plants and past methods used to win the silver from its ores.

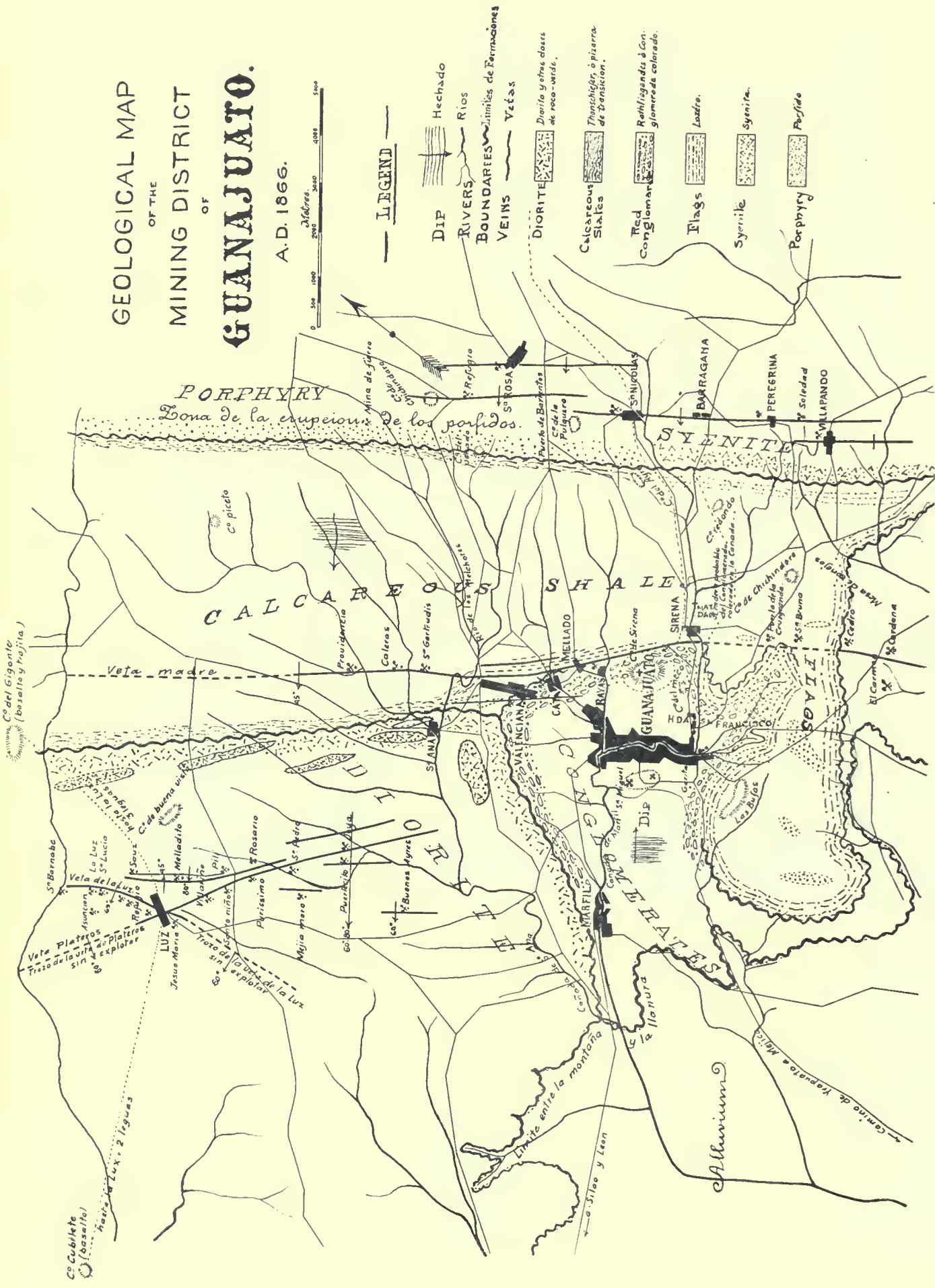
Plate No. 1 shows the geology of the district as given by Herr Tillmann in his report. In the original plate the several formations were given in colors, but in the tracing that I am forwarding the original boundaries of these formations are shown in conventional signs. This plate also shows the three vein systems of the district, the Veta Madre or Mother vein, occupying the centre, the La Luz vein system lying three miles to the southwest and the Villapanda-Santa Rosa vein system about the same distance to the southeast of the Veta Madre.



The ores of the district are valuable for silver and gold, those of the Veta Madre containing 85% of their value in silver and 15% in gold; those of the La Luz system contain 75% of their value in silver, the remainder being in gold, while the ores of the Villapanda vein system carry a higher percentage of gold, so as to make 40 and even 50% of the value of their precious content.

Plate No. 2 shows the Hacienda de Rocha in plan and photographic view, the various departments of which are shown by letters and explanations in Spanish on the margin. This is a good example of a *hacienda* using the old *patio* system, some of the interesting mechanical departments being described in detail on Plate No. 3.

Fig. 1 on Plate 3 shows the old stamp-mill, with wooden stamps shod with iron, such as were, until recently, generally used throughout Mexico and operated by mule-power. After being stamped the ore passed to the *arrastre* shown in Fig. 2, where it underwent the process of fine-grinding. The pulp was then allowed to settle and thicken and subjected to the *patio* process proper, which consisted of mixing the pulp with *magistral* (roasted and


GEOLOGICAL MAP
OF THE
MINING DISTRICT
OF
GUANAJUATO.
A.D. 1866.
— LEGEND —
Dip
Rivers
Boundaries
Veins
Hechado
Rios
Limites de Formaciones
Vetas
Diorite
Diorita y otras clases de roca-verde.
Calcareous Slates
Thonschiefer, ó pizarra de transicion.
Red Conglomerate
Rothliegendes ó Conglomerado colorado.
Flags
Lastra.
Syenite
Syenita.
Porphyry
Porfido
PORPHYRY
Zona de la erupcion de los porfidos.
SYENITE
CALCAREOUS SHALE
Veta madre
Veta de la Luz
Veta Plateros
Trozo de la veta de Plateros sin explotar
Trozo de la veta de la Luz sin explotar
Alluvium
Limite entre la montaña
Camino de Irapuato a Mexico
Hasta la Luz 2 leguas
Cº del Gigante (basalto y trajita)
Cº Cubilete (basalto)
Cº Picacho
Cº de Buena vista
Cº de la Sirena
Cº de Chichindaro
Cº de la Crispenda
Cº de la Pulguera
Cº de los Melchores
Cº de la Cañada
Cº del Cerro Redondo
Cº de la Cañada de Marfil
Cº de la Cañada de la Yerbabuena
Cº de la Cañada de la Cantera
Cº de la Cañada de la Cantera
Cº de la Cañada de la Cantera

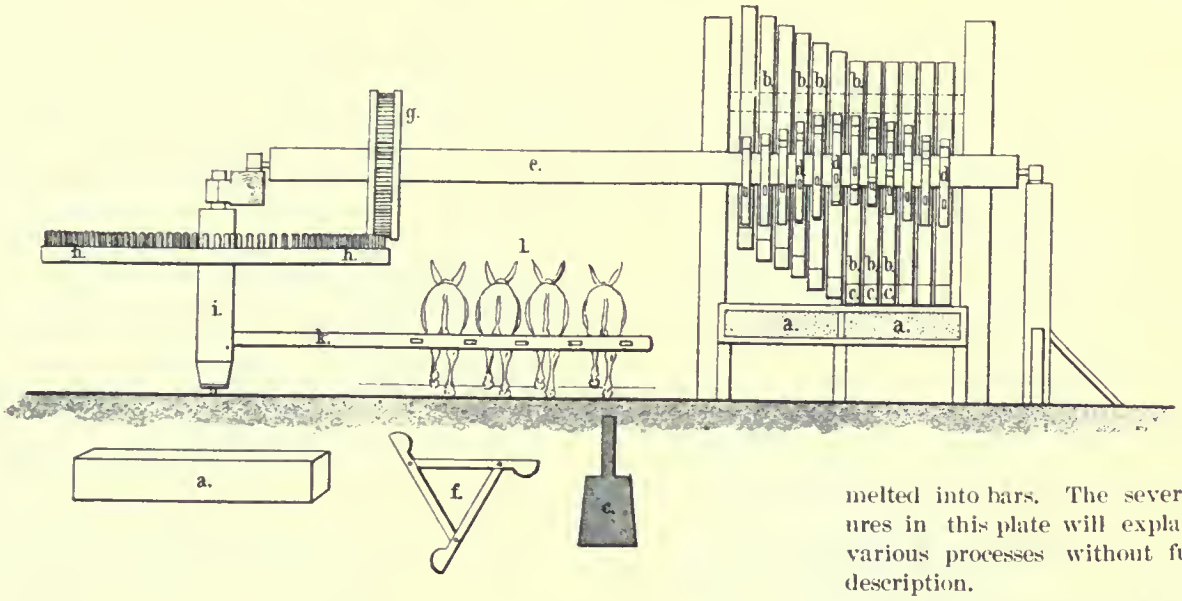


Fig. 1.

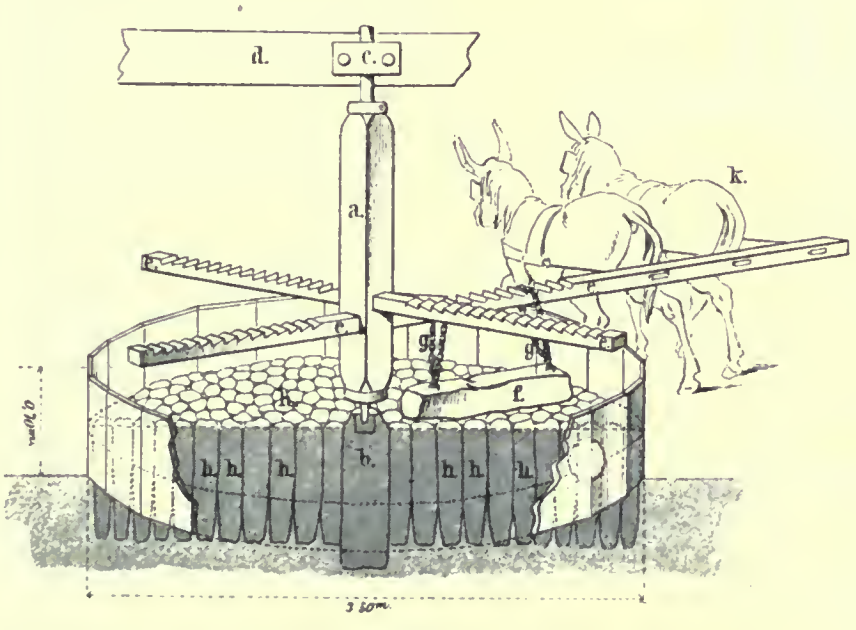


Fig. 2.

melted into bars. The several figures in this plate will explain the various processes without further description.

The sweeping changes which have taken place in the mining and milling practice in this famous old district illustrate again that in mining as in everything else: "By the wayside of progress lie the broken images of the past."

THE heaviest annual rainfall in the globe is over 600 inches, at Cherraponjee, in the Khasi hills, India; 500 in. fall from April to September during the southwest monsoon. On the basis of one inch of rain weighing 113 tons per acre, this latter quantity will amount to the astonishing weight of over 36,000,000 tons of water falling on a square mile within the period of five months! This is due to the abruptness of the mountains that face the Bay of Bengal, from which they are separated by 200 miles of low swamps and marshes. Over these the hot winds pass, absorbing the water to the point of saturation, and are ready to burst in torrents when first they meet the mountains in their path.

ground copper and marcasite), salt, and quicksilver, and exposed for a long time in the open air in layers called *tortas* on the *patio*. The pulp thus exposed was subjected to frequent mixing by a squad of mules being driven over it; then it was conveyed to the settling vats shown in Fig. 3, where it was thinned with water, which allowed the amalgam of silver formed by the mixture of quicksilver with the pulp on the *patio* above described to be washed out and settle in the bottom. Lastly, the amalgam was collected and distilled in the retort shown in Fig. 4. Fig. 5 shows the cast-iron hood raised from the retort as the process of retorting was completed, when the silver sponge formed therein would be removed and finally melted into bars.

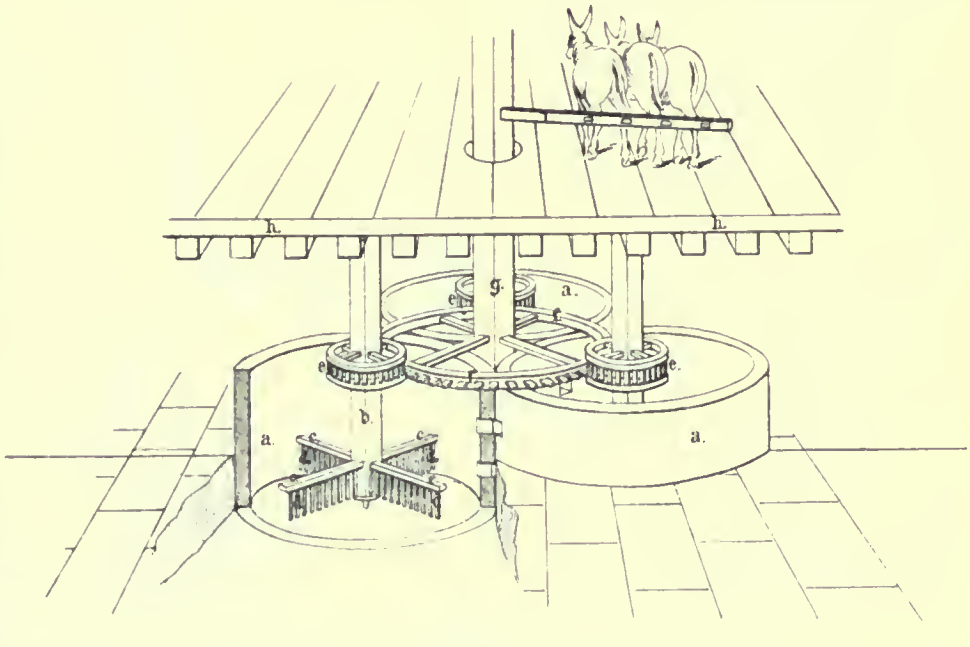


Fig. 3.

Temperature in Mines.

Some important investigations were recently undertaken in the deep mine workings and bore-holes on the Rand, which resulted in establishing the fact that there is apparently a uniform increase in temperature with depth, in that district, at least, of 1° for each 208 ft. below 1,000 ft., where the temperature is 68.75° F. It was also shown that the character of mine development has an important influence in lowering the temperature, not only of the mine air, but also of the rocks themselves to a distance of several feet from the mine opening, after continued exposure to air currents of a lower temperature.

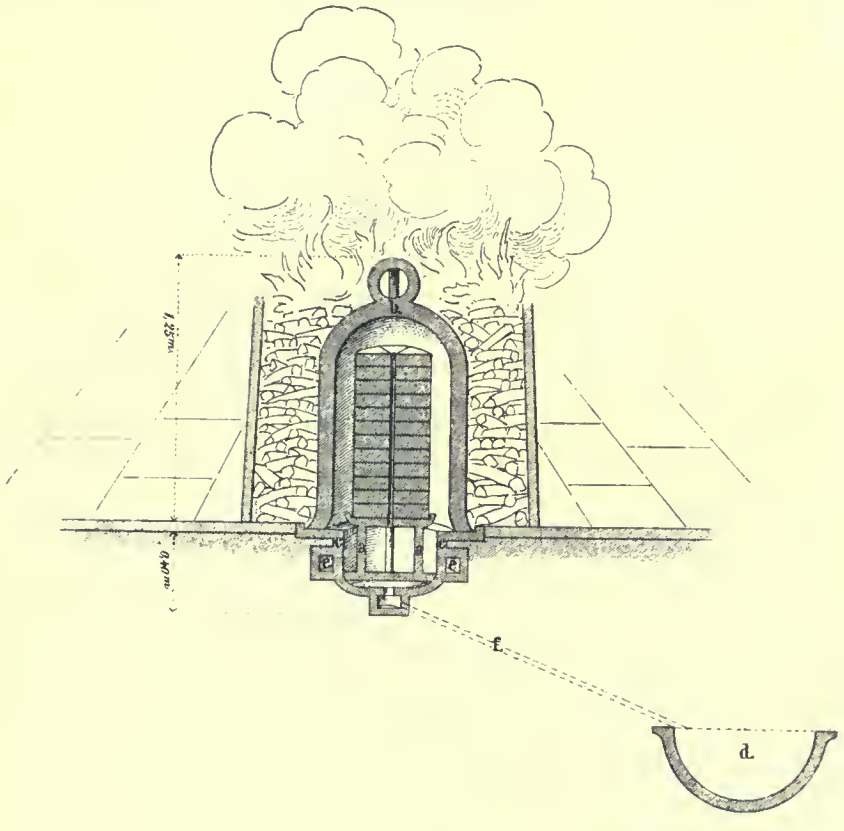


Fig. 4.

At Bendigo, in Victoria, Australia, a careful investigation proved the increase in temperature to be 1° for every 80 ft. in depth, a very noticeable difference as compared with that on the Rand. In the Dolcoath mine, in Cornwall, the increase of temperature is 1° for each 60 ft. of additional depth, a higher rate than that of Bendigo.

A number of shafts on the Mother Lode of California have passed below the 2,000-ft. vertical mark, one of them, the Kennedy, being nearly 3,000 ft., and the rate of increase of temperature is about the same as that on the Rand. No high temperatures have ever been noted in California gold mines, though in some of the quicksilver and copper mines of this State the temperature of the mine workings exceeds 120° at shallow depths, and, in at least one instance, a quicksilver deposit cannot be worked at all owing to high temperature, due to the occurrence of thermal springs in the mine workings, or in their immediate vicinity. In the copper mines referred to, it is wholly due to the rapid oxidation of bodies of sulphide ore. So rapid is this oxidation that the ore occasionally takes fire by spontaneous combustion, in the mine, and in a number of instances ore from the Daulton mine, in Madera county, and from Whiterock, in Mariposa county, have set fire to the cars while in transit to the smelter.

The great heat of the mine workings on the Comstock Lode, is due to either thermal springs, or to rapid oxidation (combustion) of the rocks in which the lode occurs; the second is likely to be caused by the first. Six miles west of the Comstock, similar springs occur at Steamboat, where cinnabar and other valuable minerals are being deposited. Attempts at mining have been abandoned there owing to the great heat of the water, though through almost superhuman endeavor a shaft was sunk in the travertine deposit to a depth of 50 ft. The water of the springs was found very corrosive, on account of the free sulphuric acid it contained.

The copper mines of Lake Superior are the deepest vertically in the world. The formation consists of a succession of lavas of extrusive origin with interbedded layers of sandstone and conglomerate. The temperature in the bottom of the deepest of these mines (a little over 5,000 ft.) is not excessive, being nearly the same as that on the Rand at equal depth.

It is not known that the geological age of the rocks in which ore deposits occur has any relation to the temperature found in the mine workings, but rather to the physical conditions obtaining in each instance. It is noteworthy, however, that the hottest mines, where the heat is due to thermal springs, are mostly in Tertiary lavas.

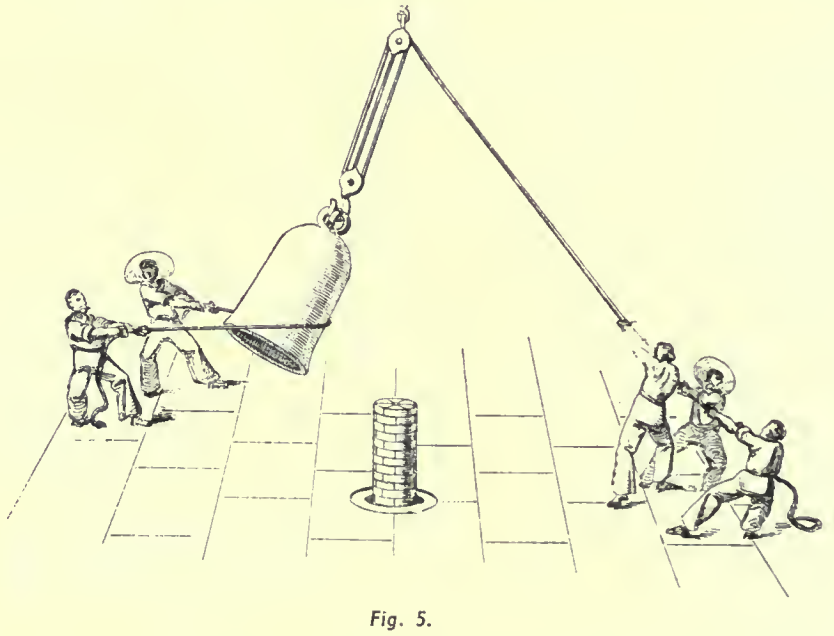


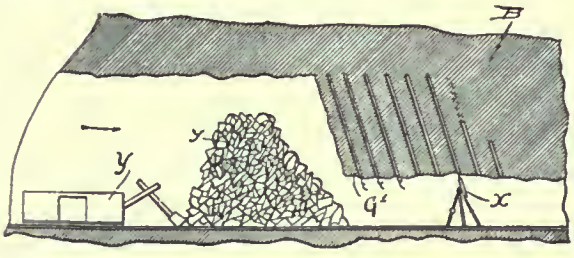
Fig. 5.

It has been observed that the air temperature in different parts of the same level of a mine varies from point to

MINING AND METALLURGICAL PATENTS.

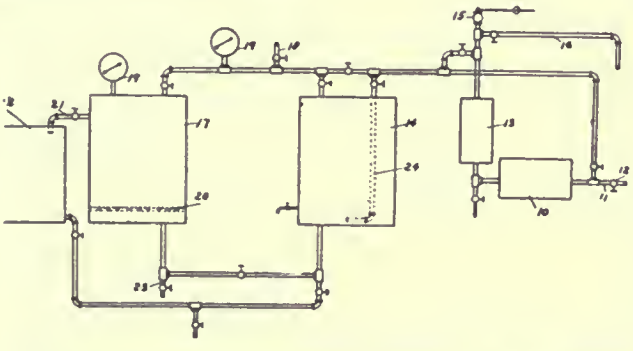
Specially reported for the MINING AND SCIENTIFIC PRESS.

METHOD FOR TUNNELING THROUGH ROCKS.—No. 840,307; Patrick Ford, Chicago, Illinois.



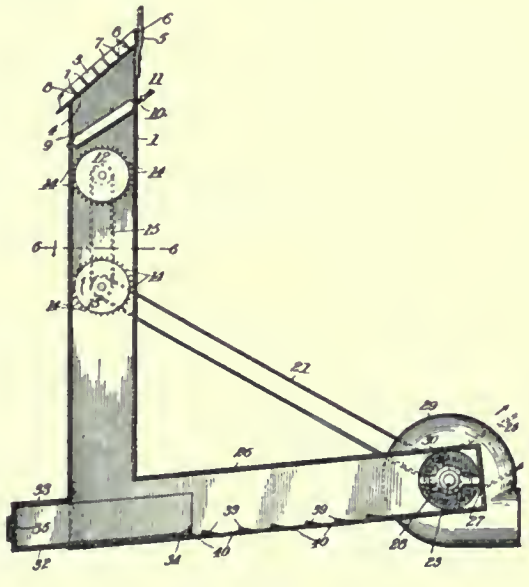
The method of excavating rock tunnels comprising first constructing an under heading for the length of the tunnel and then throwing down the material from the roof of said tunnel, into said heading and operating simultaneously at either or both ends of the tunnel.

CYANIDE PROCESS.—No. 840,840; Howard B. Goetschius, Dumont, New Jersey.



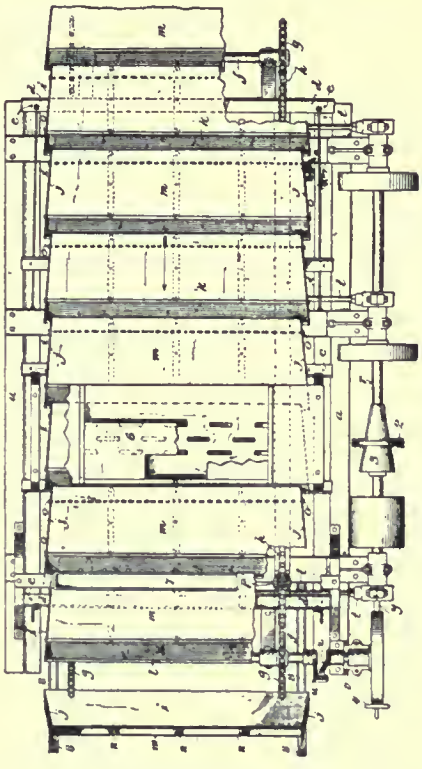
The herein-described cyanide extraction process, consisting in: First aerating the cyanide solution under pressure greater than atmospheric pressure; then forcing the aerated solution under said pressure through the ore to be treated and against a suitable back pressure.

APPARATUS FOR EXTRACTING AND SAVING GOLD.—No. 840,752; Joseph A. Coombes, Atlantic City, N. J., assignor to The Aurum Mining Company, Corporation of Arizona.



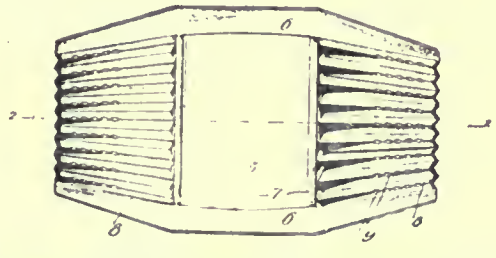
In a gold-saving apparatus, a vertical casing, an inclined hopper adjustably and removably mounted at the upper end of said casing, a pivotally-mounted inclined regulator within said casing beneath said hopper, a pair of cylinders mounted to revolve in unison within said casing beneath said regulator, and means for revolving said cylinders.

ORE-CONCENTRATING MACHINE.—No. 840,491; Henry C. Holthoff, Milwaukee, Wisconsin.



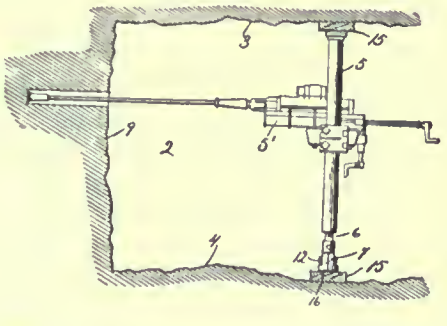
In an ore-concentrating machine, an endless belt having a series of shields attached to and movable with it and arranged with spaces between them over the working surface of the belt, and with a series of hinged leaves or sections having raised sides and adapted to lap one over another on the upper side of the belt, each leaf or section being provided with a shield partially covering its working surface.

MINER'S GOLD-PAN.—No. 840,333; Thomas Hussey, Hollywood, California.



A hand gold-pan having a portion of the upper part of the end walls corrugated and having perforations at the apices of the outer portions of the corrugations.

FOOT-PLATE FOR DRILL-COLUMNS.—No. 841,019; Arthur D. Kenyon, Cripple Creek, Colorado.



A foot-plate consisting of two parts of identical form, which may be used interchangeably, and the combination with a supporting-column provided with a jack-screw, of a foot-plate for the latter made in two parts of substantially identical form, and means which not only secure said parts together but hold the foot-plate as a whole upon said screw.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The mining law of Montana provides that on all claims a notice must be posted at the point of discovery setting forth the following facts: (1) The name of the lode; (2) the name of the locator or locators; (3) the date of the location; (4) if a lode claim, then the number of linear feet claimed along the vein each way from the point of discovery, with the width on each side of the centre of the vein, and the general course of the vein, as nearly as may be. It further provides that before the expiration of 60 days after posting such notice the locator must sink a discovery shaft upon the claim at a depth of at least 10 ft. from the lowest part of the rim of the shaft, or deeper, if necessary, to show a well-defined crevice or valuable deposit. But a cut, cross-cut, or tunnel that cuts the vein at the depth of 10 ft. below the surface, or an open-cut of at least 10 ft. in length along the lode from the point where the lead is discovered, is declared to be equivalent to the discovery shaft. The Supreme Court of Montana, in speaking of the sufficiency of a notice under this statute, said that the requirement of the statute, that the notice must state the dimensions, could have no other purpose than to show a compliance with the law; "and while we do not say that the notice shall state definitely that the excavation cuts the vein to the depth or for the length required by the statute, yet the statement of the dimensions must be such as to leave at least an inference that such is the case, and a notice which fails to state the work done certainly does not conform to the spirit of the statute."

Helena Gold &c. Co. *v.* Baggaley, (Mont.) 87. Pac. 455.

The United States statutes provide that in an adverse suit, if the title to the ground in controversy should not be established by either party it should be the duty of the jury to so find, and that judgment be entered according to the verdict. The object of this statute is said to be, to provide that in the case of a failure of proof of title, for an adjudication that neither party was entitled to the property and that the applicant could not then go forward with the proceedings in the land office simply because the adverse claimant had failed to make out his case, if he himself had failed.

Brown *v.* Gurney, 27 Sup. Ct. 509.

The rules as to the location of mining claims do not exclude other prospectors from the area of the claim absolutely, but only prohibits the acquisition of rights within the area which would interfere or conflict with the right of the first discoverer to swing his claim so as to lay it along the lode after his explorations demonstrate its strike. The effect of this is that a subsequent explorer would go into such area at his peril. But the result would be that after the first discoverer had completed his work and located his claim, the junior discoverer ought to be secure in any location made by him in the meantime upon other portions of the area not in conflict with the rights of the first discoverer.

Helena Gold &c. Co. *v.* Baggaley, (Mont.) 87 Pac. 455.

The owners of four mining claims contracted with the complainant to develop what was termed the Anvil Creek property, which they owned, and the contract recited that the complainant should receive as compensation a certain per cent of the net output of two claims, naming them, and it further stated that the agreement should continue until 'said claims' were worked out. In passing on the validity of the contract and the rights of the parties the Court decided that the contract was ambiguous as to whether or not it included the four claims or only the two referred to, and that parol evidence was properly admitted to show that the Anvil Creek property was the two specified claims, and that a subsequent oral agreement had been made as to the other property.

Lindblom *v.* Fallott, 145 Fed. 805.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The specimen from Manvel, Cal., marked J. S. G., is a silicious rock, somewhat calcareous, and coated with green serpentine.

E. H. R., of Dixie, Idaho, sends black sand containing Magnetite, Ilmenite, Garnet, and globules of Mercury. The microscope does not show any platinum grains.

The red mineral and yellowish green coating from D. C. F. of Riverside, Cal., are the hydrous arsenate of iron, Scorodite, and they have probably been formed from the decomposition of arsenopyrite.

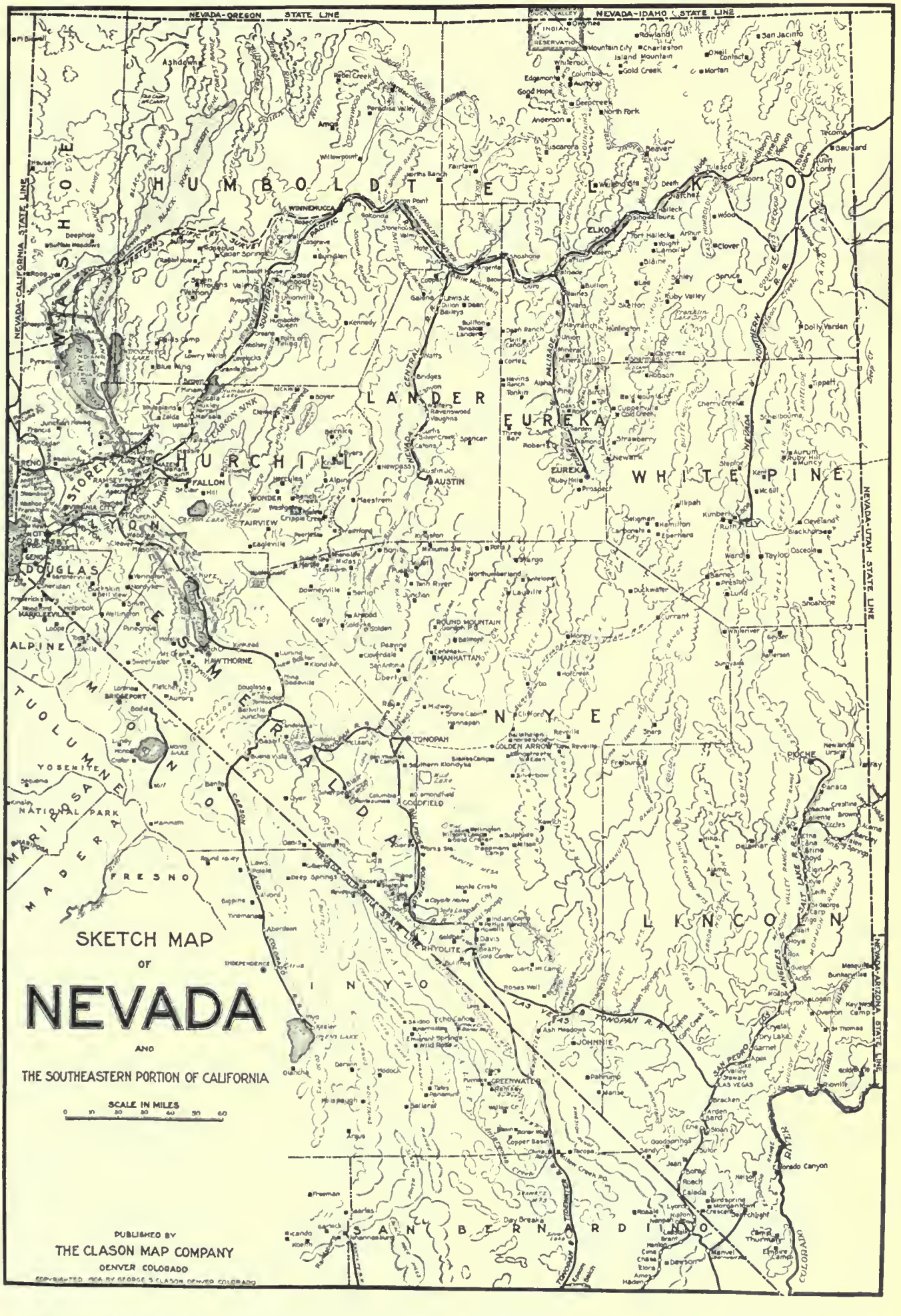
The minerals from P. H. B., of Wickenburg, Ariz., are: No. 1, a Zeolite, analogous in composition and properties to epistilbite, a hydrous lime alumina silicate; No. 2 contains fine granular black Hematite in matrix.

Specimens from T. P. G., of Alamos, Sonora, Mexico, are: No. 1, altered rock stained with Hematite; No. 2, Rhyolite; No. 3, Felsite; No. 4, Feldspar-Porphyry; No. 5, cellular Quartz with imbedded Pyrite and containing small yellow crystals of sulphur in the cavities.

The rocks from Homestead, Oregon, marked E. A., are: No. 1, serpentinized basic rock, probably Dioritic; No. 2, Granite, or Grano-diorite; No. 3, Felsite; No. 4, Grano-diorite; No. 5, felsitic rocks containing a little Cobalt bloom; No. 6, an altered volcanic rock; No. 7, Porphyrite; No. 8, Diorite.

SCARCITY OF PLATINUM.—All the platinum that has ever been produced from all countries of the globe, since the first discovery of the metal, would barely exceed 100 tons of the fine metal. You could put it all, in a single block, in a room 10 metres cube. The largest nugget of platinum ever found weighed 9½ kilos—about 20 lb. Never in its history was there so great a demand for platinum as today, yet, with the mining world keenly alive to its importance, with its double-the-price-of-gold present-day incentive, with experts searching for it here and there the world o'er, and mine-owners urging the output 'to the limit,' still the annual platinum 'crop' of the globe barely touches half-a-dozen tons. Three decades ago the value of platinum was $2 per ounce. Today it is above $32.

To most of us, indeed, the earth is still as flat as though Columbus had never sailed from Palos, and the relations and distances it reveals are often a shock. There are the Philippines, which we persist in regarding as lying just a step or two beyond Hawaii. There is South America, which, instead of lying decently south of North America, as its name would imply, persists in sticking out absurdly eastward into the Atlantic Ocean, so that a brick hurled due south by an enraged giant at Tampa, would skim right over Panama and plump into the Pacific. There is the Panama Canal itself, with its eastern terminus lying west of its western terminus. There is Cuba, which we instinctively locate somewhere southeast in the Atlantic, though Havana lies nine degrees west of the meridian of New York.—*Evening Post*, New York.



This new map of Nevada was furnished to us by the Clason Map Co., of Denver. A guide map for the pocket and a folding reference map on canvas can be secured from them or from us, the price bieng $1 and $5, respectively.

Portable Track.

The Arthur Koppel Co. makes a portable track, which can be removed in a few minutes by two men, before blasting. The track is mounted on light steel ties, and the rails are 50 ft. long, so as to allow them to be easily carried. For this portable track, rails up to 12 lb. per yd. can be furnished. The connection between the rails and ties is made by means of clips and bolts, this being the most suitable and durable way, but other systems can be furnished if desired, such as rivets, clutch-bolts, etc. The connection

between the different sections is generally made by fish-plates and bolts, but angle-joints can be supplied, if preferred. The carrying capacity of this portable track varies from two tons for a 9-lb. rail to seven tons for a 20-lb. rail. Switches and turn-tables are constructed so as to be easily removed without any disturbance of the road-bed. Light cars can be furnished, which are so designed as to be portable, and at the same time possess strength enough to carry the load safely. This makes a combination of equipment that may be easily torn up and removed to another part of the mine, with a minimum expenditure of time and labor. This company makes a specialty of charging cars, suitable for carrying coal, ashes, cinders, etc., to and from boiler-rooms. It also carries on hand a large stock of track materials, steel rails of all weights, standard types of wooden and steel dump-cars, flat cars, portable tracks, switches, frogs, turn-tables, wheels, axles, and other equipments.

Commercial Paragraphs.

STEPHENS-ADAMSON MFG. CO., of Aurora, Ill., publish a monthly pamphlet entitled 'Conveying and Transmission,' devoted to the mechanical handling of materials and the transmission of power.

THE PIQUA BLOWER CO. of Piqua, Ohio, is being incorporated under the laws of Ohio with a capital of $50,000. This corporation will take over the interests of the Piqua Foundry & Machine Co., and will make a specialty of the manufacture of positive blowers and gas exhausters as developed by the latter company in the past two years.

THE BARNES-KING DEVELOPMENT CO. will be in the market for all kinds of equipment, including rolls, crushers, belt conveyors, elevators, and mechanical distributors of all kinds; electric hoists, machine drills, mine and mill equipment generally, cyanide equipment and supplies. Manufacturers and business houses interested in this class of equipment should send catalogues and lists to the mine office, at Kendall, Montana.

The miniature catalogues of the A. S. CAMERON STEAM PUMP WORKS, as illustrated above, are printed in English, German, and Spanish. They contain full information as regards types and prices of the Cameron Pumps and can be had on application.

Books Received.

MEXICO'S TREASURE HOUSE, GUANAJUATO, by Percy F. Martin. This is a descriptive account of the mines and mining methods of a famous locality by an English journalist who visited Mexico recently as representative of *The Financial News*. It is a handsome volume of 250 pages, well printed and copiously illustrated. In addition to the interesting descriptions, there is plenty of statistical information. The book is published by The Cheltenham Press, of New York, and is for sale by the MINING AND SCIENTIFIC PRESS at $3.

LEAD SMELTING AND REFINING. Edited by W. R. Ingalls. This is a re-print of articles that has appeared in *The Engineering & Mining Journal*, the *Transactions* of the American Institute of Mining Engineers, together with abstracts of papers presented before other engineering societies. Special attention is given to the desulphurization of galena by what are known as 'lime roasting' processes. The volume comprises 320 pages and contains much useful information gathered from authoritative sources and edited by a skillful hand. It is published by the Hill Publishing Co., New York, and is for sale by the MINING AND SCIENTIFIC PRESS at $3.

GEOLOGY, by T. C. Chamberlin and R. D. Salisbury. Three volumes, making 2,000 pages. This is the most elaborate, most comprehensive, and most modern of all textbooks on geology. It is intended for advanced students and deals with the very latest ideas on a big subject. Vol. I is devoted to Geologic Processes and their Results; Vol. II and III, to Earth History. The authors are acknowledged leaders of scientific thought and widely experienced in field geology, not only in their own country, but in other parts of the world. Therefore this monumental treatise gives not only the very latest information but suggests new lines of thought and scientific development. The geographic portion of the first volume is beautifully illustrated, in a manner quite unlike any other textbook, in fact, all of the volumes are full of excellent diagrams, maps, and half-tones, splendidly printed on heavy glazed paper so as to do them full justice. Therefore, the educational function of the book is facilitated and made attractive to the reader. One drawback may be noted; the inclusion of many theories originating with the authors, and not yet assimilated in accepted science, weakens the book as a textbook, for textbooks should include only ideas that have passed beyond the disputative stage. Some of the authors' views are still on trial, and the prominence given to them is a tactical blunder. On the other hand, as the book is not for mere beginners but for real students, its originality will be appreciated. Despite the vast amount of reading matter provided, there has been decided condensation, so that the volumes are almost encyclopediac in character. The judicial frame of mind, the mastery of their subject, and the moderation of statement of the authors are evident throughout. It is a noble work and does honor to American science. The book is published by Henry Holt & Co., New York, and is for sale by the MINING AND SCIENTIFIC PRESS at $12.

Trade Treatises.

ALLIS-CHALMERS COMPANY issue Bulletin No. 1,501, describing their belted Corliss engines.

WITTE IRON WORKS CO., of Kansas City, Mo., issue an attractive pamphlet devoted to the engines that they manufacture, especially designed to use gas, gasoline, naptha, or distillate.

WESTERN GAS ENGINE CO., of Los Angeles, Cal., has issued an interesting pamphlet on Western Engines for all power purposes, such as this company manufactures. The catalogue gives useful data on gas engines.

SULLIVAN DIAMOND CORE DRILLS is the title of a handsome pamphlet of 160 pages in stiff binding, just issued by the Sullivan Machinery Co., of Chicago. The pamphlet is beautifully illustrated, and contains price lists, together with various data useful to a mine superintendent.

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Editorial.

THE REVIVAL of agitation against dredging for gold at Oroville renders timely the article on 'Dredging and Horticulture' by Mr. D'Arcy Weatherbe. It is uncertain whether the anti-debris talk is to be taken as disguised blackmail or merely individualism of an extreme type. We are glad to learn that there is to be a friendly conference between the Dredging Association and the Anti-debris Association, and we hope that good sense will prevail.

A MARKET LETTER from a firm of brokers recently in trouble advertises the fact that the Governor of Nevada is on their directorate and on the board of several mining companies. The circular closes by stating that the Governor is "familiarly known in Nevada as Honest John." This is undoubtedly true in every sense, and it is because Mr. John Sparks is an honorable man that we refer again to that colossal fallacy, namely, that governors, generals, admirals, or any other distinguished citizens are necessarily able to pass upon the value of a mine or to manage its affairs. The plain fact is that such names are used by promoters as a lure and it is the vanity of great men to suppose that their endorsement of an enterprise will make it successful. Into this error the public falls readily, not realizing that the only opinion of a mining undertaking that is worth anything at all is that which is based on experience and technical knowledge.

WE note with pleasure that the scheme to amalgamate the mines of the Copper Range Consolidated with a lot of other properties, has failed. Of the mining companies in the Lake Superior region none is better managed, financially and technically, than the Copper Range Consolidated. The credit is due mainly to Mr. William A. Paine at Boston and Mr. Frederick W. Denton at Houghton. Consolidation of holdings is well enough when it means economy of administration, but this idea of mere bigness is a blunder. Once you work with a unit of proper size, there is no particular gain in enlarging it, and the Copper Range Consolidated includes three large mines, with their respective mills, a railroad, half interest in a smelter, and other property quite sufficient to keep even the best administration fully employed.

The subject invites further remark. The amalgamation, using the word in more than its literal sense, of mining companies, means the control of immense interests by the group of men associated with the Amalgamated Copper Company. Now, Mr. Thomas F. Cole and his partner, Mr. John D. Ryan, whose names appear with tiresome iteration in all the news-letters from the mining centres of the country, are men of unusual ability, likely enough, but it is absurd to suppose that they can apply that ability usefully among such a multiplicity of engage-

ments. The fact is they are engaged in gambling on a large scale and they have a financial backing strong enough to enable them to form all these immense consolidations. In the end either they will bite off more than they can comfortably assimilate, and we shall have a disastrous collapse, or they will become part of the financial tyranny represented by the Standard Oil group. For the technical men, the mining engineers and metallurgists, of the Amalgamated Company, we have the highest respect—no enterprise is served by greater scientific ability—but of the blind-pool type of finance that the Amalgamated represents there can be only one opinion. It stands for corruption on a large scale, for colossal gambling with the funds of corportions, and for the irresponsible type of finance represented by Mr. E. H. Harriman and others whose training is that of the Wall Street plunger.

Gratuitous Advice.

By a recent judicial decision a London newspaper has been held responsible for giving wrong advice to a reader who asked for guidance in share speculation and a judgment for the full extent of his loss, namely $7,000, has been entered by the Lord Chief Justice against the publisher, C. A. Pearson. This episode is not without a moral and we hope it will serve as a precedent. In the first place, people should not give advice gratuitously and the public should not ask for it on such terms. Two wrongs cannot make a right, but the publisher is the more erring of the two because he pretends to have special knowledge, sufficient to make his advice valuable. This is rarely the case, for, as we have said again and again, no information on a mine is worth anything that is based on hearsay, and newspapers retain only reporters—not mining engineers—to collect the data they use. With a technical periodical it is different, and that is exactly why the respectable technical press does not give advice on stocks. It is not the province of the editor to give information that should be obtained in the usual way, by engaging the services of a professional man. It is not necessary always to send him to the mine at a big expense; often he knows enough about the locality or the conditions surrounding an enterprise to give a bit of good advice, and in such cases a small fee will meet the case. On the other hand, this writing to papers for advice on stocks tends to breed a corrupt journalism that does great harm, to simple people—and in mining the public in general is simplicity itself. The habit of expecting something for nothing, of asking financial advice from newspapers, has caused a multitude of parasitic sheets to spring up all over the country, after the model of the gutter press of London, where this sort of thing is done on a large scale all the time. Mining companies that advertise in such papers get kindly mention and warm puffs; those that do not, receive cold neglect and sometimes vicious criticism. A simple-minded speculator who writes to ask concerning the value of his stock and the prospects of the mine it represents will receive a reply colored rosy or blue according to the exact financial relation between the publisher and the mining company. We are getting much of this sort of thing in America now; formerly it was uncommon. The warm air of stock gambling has forced a growth of pseudo-journalism and it will flourish as long as a large portion of the public is speculating in cheap stocks. The postal authorities can do something to stop it, but the worst forms of the practice avoid illegality and are impossible to punish. In the meanwhile we would like to see a test case brought to trial on this side, similar to that just decided at London.

State Mining Legislation.

An important mining bill is before the Legislature of the State of California. We refer to Senate Bill No. 55. There is nothing objectionable in the measure, except the requirements as to recording with the district recorders. The county recorder's office is the proper place, and the necessity for duplicating the record is not only inconvenient, but a nuisance without any compensating feature. Under the proposed act the locator has over three months to complete his record; this certainly gives ample time for him to record his notice, even if the county seat is far removed from the place of his location. All transfers, agreements, bonds, mortgages, and other instruments affecting title to mining claims must be filed in the county recorder's office. There appears, therefore, to be no necessity for a district recorder with whom nothing but notices of location could, in the nature of things, be recorded. If the State proposes to pass legislation on the general lines outlined in this bill, we can see no reason for perpetuating the mining district. The bill covers fully the field which, in the absence of such legislation, might, to some extent at least, be regulated by local district rules. In the enactment of such legislation we think the district recorder should be eliminated.

The act is framed in the main on the Nevada statute. Experience has shown that that law works satisfactorily, with the exception of the requirement for recording in two places. At the present time California has no law upon the subjects covered by the bill. We should have a law at least defining the manner of making locations, performance of location work, providing for a proper record of the claim, and the marking of the boundaries, making certificates of location *prima facie* evidence of performance of certain acts, and enabling locators to start out in life with the semblance of a paper title in the form of a statutory notice of location properly recorded. Sections 12 and 13 refer to the property rights conveyed by mining claims; these clauses are useless. This is not a subject upon which the State is permitted to legislate The nature and extent of the property right acquired by location is determined by the Federal law. These two sections, however, may be said to be harmless, as declaratory of the Federal law. Section 16 is subject to the same criticism and comment.

In its main features the measure is a good one. Among the States producing precious metals and under the Public Land regulations, California is the only one that has no legislation on the subjects dealt with in the bill. The mining interests of the State will not suffer if the legislature follows precedents that seem to work well in other jurisdictions.

By the Way.

In a recent issue of *The Times*, New York, there is an article by Mr. Daniel Guggenheim, dealing with the metal markets. He says:

The business of the world has been seriously hampered during the latter half of the year 1906 by a lack of sufficient capital. In other words, the production of the money metals, on which all currency is based, has not kept pace with the increasing demands of the world. These demands have been due to plentiful crop, large consumption due to prosperity, and enhancing values.

To what extent these enhanced values have been produced by an increased production of gold is a question of great interest, but one which cannot, unfortunately, be settled dogmatically. As a matter of fact, the production of gold has increased during the past ten years by leaps and bounds. During the '80s the production of gold in the world ran as low as about $90,000,000. For the year 1905 the Director of the Mint estimates the value of the gold production of the world at $375,000,000, and during the year 1906 the production has increased doubtless more than during any preceding year. This has notably been the case in South Africa and in the United States. Alaska has for years been a growing factor in the gold production of the world, and recent developments there seem to indicate, on account of the influx of large amounts of capital which are necessary for the development of such gold-fields as are there found, that the year 1907 will show a notable increase. Notwithstanding these millions of new capital, the world seems to be crying for more, and the need is apparently as great today as during any previous period of the past. With the wealth of the world increasing, the consumption of gold in the arts is constantly augmented.

The prosperity of the countries usually referred to as 'silver countries,' but whose accumulated capital is now being held in gold, has made during the past year and is likely to make during the years to come, a very decided drain upon the gold resources of the world. South America, Japan, India, and even Mexico, are receiving and hoarding gold by the millions, and the central gold market of the world, London, has been denuded of its capital to such an extent that the great Bank of England has been obliged to call upon the Bank of France in its urgent need, and is now demanding that the gold reserve of the banks of London shall be materially increased. The recovery of South Africa from the effects of the Boer war; the great discoveries of gold in Nevada; the influx of capital and more modern mining appliances into Alaska, all point to a materially increased production of gold for the year 1907. But doubtless the scramble for the yellow metal will go on as fiercely as in the past.

The position of silver in the world is unique. As a production it has shown no increase for the past ten years. The report of the Director of the Mint for the year 1905 conforms almost exactly to the production of the year 1896, namely, 157,000,000 ounces. During this period of ten years the price of silver in the New York market has been as low as 46 cents, and at the close of the year 1906 it was selling above 70 cents, or an increased price of more than 50%, yet the reports of the Director of the Mint show a decline in production for the year 1905, as compared with the preceding year, and there seems every reason to believe that no increase in the production of silver has taken place during the year 1906.

As a matter of fact, silver is produced largely as a by-product in connection with the production of copper and lead. Its production, therefore, is not based upon its value. Furthermore, and peculiarly, the consumption of silver is also not regulated except to a very minor extent by its value, at least within known ranges. The United States, needing to buy silver to satisfy the demands of the people for subsidiary currency, the silver will be purchased, since the Government coins it at the rate of $1.38 per ounce. If the silver can be purchased at 69 cents, the Government issues it at double its cost, and should the cost of the metal be one dollar per ounce, the Government would purchase the same quantity, but would make a profit of 38% instead of 100% in coining. This is similarly the case with most of the coinages of the world. The consumption of silver in the arts is constantly increasing with the increased number of inhabitants and the increased wealth of the world. Doubtless an increased price, if considerable, would make an appreciable difference in the consumption of silver in the arts, but as compared with the total consumption this would be insignificant.

For many years there has been no accumulation of silver. Consumption has at least been equal to production at all times, and for several years it has been considerably in excess of the amount produced yearly from the mines of the world. The additional amounts consumed have been obtained from various sources, notably, the accumulation in the treasury of the United States at Washington; the accumulation at Berlin, caused by the demonetization of silver in Germany in 1869, and the silver reserve held against circulation in Mexico, Japan, and various South American countries. Apparently these various supplies have been nearly, if not quite, exhausted, and, unless some new, notable discovery of silver is made, the demand for silver during the year 1907 is likely to far exceed the supply. India always has consumed on the average about 50% of the world's production of silver.

Several years since it was predicted that aluminum would certainly take the place of copper, should its price materially exceed 15 cents per pound. This now proves to have been a delusion, as, with the constantly increasing production, the price has reached 24 cents per pound, and is being vigorously pushed higher. The production of copper is constantly increasing, but as yet the increase does not equal the increased demand. The large producing mines which have been in existence for years cannot materially increase their production. Economic working requires full production at all times without regard to price. The only hope for increased production lies in the discovery and development of new properties. The development of such mines and the construction of the necessary reduction works require years of time and millions of money. The wonderful discoveries of copper ore in Nevada were made three years ago. Several properties which will be large producers in time have been in constant process of development, and reduction works are now planned, but it will be some time yet before any considerable production of fine copper is derived from this source.

Reports of prospectors as to copper mines in Alaska have for years been so highly colored as to seem like fairy tales. Reliable engineers, however, have reported this past summer on several copper properties which indicate that in time, but probably not in less than three years, Alaska will become a considerable producer of copper. Similarly the copper mines of the Congo await development and the construction of reduction works and railroads, which will delay the receipt of copper from this source doubtless for five years or more.

From the above it will be seen that the increase in the production of copper is bound to be gradual, and may not more than keep pace with the increasing demands of the world.

Special Correspondence.

Johannesburg, Transvaal.

Politics.—Publication of Pamphlets.—The New Constitution.—Eight-Hour Day.—Outlook Uncertain.

That political party known as the Progressive is becoming rather aggressive. Of late several trenchant pamphlets dealing with the situation have appeared, and one is reminded of a big political fight in England, where pamphleteering plays so important a part. The labor question is the principal topic of these papers. They ably refute the affirmations often made by irresponsible aspirants for political honors, namely, that there is ample native labor in South Africa for all requirements, and that the introduction of Chinese was unnecessary. In one of the pamphlets it is clearly shown that commissions appointed to investigate the native labor supply, came to the conclusion that South Africa could not supply all needs. There has been an incessant cry of shortness of labor in this country for the last fifteen years. One of the most interesting pamphlets is headed 'E. P. Solomon's Diary.' This gentleman is the leader of the National Association (which their opponents have christened the National Asses) and is violently anti-Chinese. In this pamphlet it is clearly shown how the mines will close down as soon as the Chinese are repatriated. On nearly every mine, and in most of the towns, the different parties have held meetings. It looks as if the Progressive or pro-Chinese party were gaining the confidence of the voters of the Witwatersrand. There seems to be serious dissension in the ranks of the National Association, and many people predict its disruption.

The publishing of the Letters Patent of the new constitution granted by the Liberal Government has not been hailed with satisfaction by the British population, while the Boers are delighted with the document. There is no doubt that it is highly favorable to the Boers. From reading the constitution one would think that Chinese labor on the Rand was doomed. It is stated that the coolies must be sent away one year from the sitting of the first parliament, or sooner, if the first parliament so desires. Parliament will meet about July, 1907, so that if the law regarding Chinese is carried out, there should be no coolies for the mines in July, 1908. This is a very serious outlook, for it practically means that a number of mines well be forced to close down. No one acquainted with the situation expects to find sufficient Kaffirs to take the place of the Chinamen. There is only one hope for the retention of the coolies, and that is the success of the Progressive party.

If the majority in the first parliament vote in favor of Chinese labor, it is believed that the Home Government will not interfere in a subject of such vital importance. The Progressive party has a good fighting chance of winning the elections, hence the aggressive tactics they are adopting. They will put up a good fight.

As a bait for the labor vote, most of the parties are putting the eight-hour day as a plank in their platform. One party is very much against the running of the railroads for revenue, but if the Government is not supplied with money through the railroads, it is difficult to see where the revenue to run the country will come from. Another favorite plank is the reduction of the expensive Government service which now exists. Every one is preaching economy.

Speculative ventures still appeal to the public here, and in spite of the scarcity of money, several new mining schemes that have come out lately are eagerly bought up. Very little business is done in proved mines. One notices that at present prices several mines on the Rand are well worth having. But if the Chinese depart, these mines will not be worth much. It is a big risk to buy the shares.

City of Mexico.

The Boleo Copper Co.—Large Operations.—Pacific Copper Co.—Activity in Chihuahua.—Quebradillas Mill.—Almoloya District.—The Batopilas.—Production Maintained.—Encinillas Smelter.—Dividend from the Amparo Mines.—Boom in Nuevo Leon.—General Activity.

The Boleo Copper Co., the French concern in which the Rothschilds are principally interested, and which owns the smelter and mines at Santa Rosalia, in Lower California, is in a prosperous condition. During the year 1906, the smelter treated 302,500 tons of ore; the product, of a value of about $5,000,000, was shipped to Europe. All coke for the smelter is imported direct from Cardiff. At present the Boleo company is paying employees $160,000 monthly. At the Purgatorio group of mines the monthly payroll is $45,000; at the Providencia group, $35,000; and at the Soledad group, $32,000. The smelter employees draw $17,000 per month, and other employees draw $31,000. The company controls the town and port of Santa Rosalia. The stores, meat market, and bakery are owned by the company, and a theatre and public bath are maintained for the benefit of the employees. Ernest Michot, the general manager, will soon visit the Inguaran copper mines, in the State of Michoacan, which is also owned by the Boleo company. It is stated that a railroad will be built from the Inguaran mines to the Pacific port of Zihuantanejo.

The Pacific Copper Co. has shipped a large amount of machinery to its property at La Union, in Guerrero. H. L. Swain is the consulting engineer. The company has a capital of $10,000,000, and controls about 1,000 pertenencias of copper land, situated about 30 miles east of the port of Zihuantanejo, and not far distant from the Inguaran mines of the Boleo company.

The prospects of an active year in mining in Chihuahua are good. During the past two months C. M. Schwab and W. C. Greene have invested fully $2,000,000 in Chihuahua mines; the American Smelting & Refining Co. is building a great smelter at Chihuahua; at Parral, the Parral Power & Reduction Co. has a large plant from which it expects to distribute power for mining purposes; the Greene Gold-Silver Co. has built the best wagon-road in Mexico from Temosachic, on the Chihuahua & Pacific railroad, to Ocampo.——The Mexican Gold Fields Co. expects to start dredging operations during the year on its placer ground known as the Santo Domingo placers, on the Conchas river. G. H. Lehr, of Chicago, the president of the company, is here with a California dredgerman, making a study of the ground.——The work on the new 80-stamp mill at the Quebradillas mine in the Parral district is progressing rapidly, and the mill will be in operation within six months.——The Almoloya Mining Co., composed of Monterey people, shipped 4,000 tons of high-grade zinc ore during 1906. The ore is calamine. The company expects soon to strike silver-lead and copper ores similar to the Cigarrero mine adjoining.

The Batopilas Mining Co. operates under a concession from the Mexican Government, covering 61 square miles of mineralized territory in Chihuahua. This company is capitalized at $9,000,000, and, during its existence, it has shipped over $19,000,000 in silver bars. It has two mills for the reduction of its ores, one of 100 stamps for treating low-grade stuff and one with 25 stamps for high-grade and native silver ore. These mills are run by water-power, the water being conducted through an

aqueduct of solid masonry, built along the mountain-side for a distance of two miles. An adit nearly two miles in length runs through the property, cutting several bonanza veins. Haulage in this adit is by gasoline locomotives. The first shipment in January was 77 bars of silver bullion, worth $111,000.——At Ojo Caliente, Jas. Gasson has a shaft down 400 ft. Some rich silver ore has been found in this camp.——More stacks are being erected at the Encinillas smelter at Santa Rosalia, and the new management is contracting for ore. The plant has been going to start for some time, but complications have always prevented. The Encinillas Mines Co., Ltd., is owned principally in France. Hundreds of thousands of dollars have been spent, with no return. The company pumps have been installed and the work of unwatering the old mines has begun. This group comprises the San Vicente, Dolores, Santiago, and San Pablo properties, all of which have been under water since 1898. The Dolores shaft is 375 ft. deep, and all the shafts are connected at depth. Daniel Milmo and M. T. Cogle, of Loredo, are the principal owners.——The Santa Maria and Anexas properties are shipping six cars of zinc-blende per month. The Santa Maria shaft is down 240 ft.——Adjoining these Garnett properties are the eight properties leased by the Santos Zinc Co., and in turn leased by them to the American Metal Co. These properties are producing about 400 tons per month.——The most important mine in the Sabinas Hidalgo district is

Sketch Map of Mexico.

has no ore of its own, and the smelter will have to depend upon custom work.

The Amparo Mining Co., of Philadelphia, which owns the Santo Domingo, San Juan, Union, and other mines in the Etzatlan district, in Jalisco, has declared its first dividend of 3%. This company was organized with a capitalization of $3,000,000, but $1,000,000 of treasury stock was retired last year. In 1906 the mine produced 863,850 oz. silver and 7,717 oz. gold. The foundations for the company's new 40-stamp mill, in Magistral cañon, are completed.——The Ayutla Mining Co., of Jalisco, has resumed operations. The local stockholders are A. W. Geist, E. G. Coffman, and A. H. Brewer, and Boston capital has become interested with them. The company owns the San Felipe, Zapatero y Anexas, and Vesuvio properties, and the surface holdings amount to about 60 pertenencias. About 3,000 ft. of development work has been done, and the ore runs about 10% copper, with good gold and silver values.

The Sabinas Hidalgo and Vallecillos districts in Nuevo Leon are reported to be experiencing a great boom, in spite of the scarcity of laborers. The Vallecillos camp is producing from 800 to 1,000 tons per month, including lead-silver and zinc ores. The Vallecillos company has the best equipped outfit in camp, and has just finished the work of separating and concentrating the old dumps at its mines, a work which has taken five years. Large the Cruz del Aire. This property has just paid its fifteenth monthly dividend of $5 per share on 1,500 shares. The output is about 400 tons per month, including lead and zinc ores.

Toronto, Canada.

Report of the Geological Survey.—Interesting Account.—Coal in the Northwest.—Valuable Discoveries.—Gold on the Watson and Wheaton Rivers.—Occurrence of Tellurides.—The Klondike Gravels.—Vast Deposits Still Available.—The Tulameen River.—Rossland.—Report by Brock.—Extension of Cobalt Region.—Insufficient Funds for Survey Work.

The summary report of the Geological Survey of Canada for 1906, which has just been issued, gives an interesting resume of mining conditions in Canada, and the results of the investigations made by the exploration parties sent out by the Survey during the year, some of which are of great significance. Brief reference has already been made to some of the more important features of the volume, especially to the opinion expressed by the Director, Mr. A. P. Low, as to the situation at Cobalt. The reports of some of the field parties engaged in researches in less known and more remote portions of the country, contain a mass of information, many details of which have an important bearing upon the mining and metallurgical industries.

In accordance with the policy of the Survey the field work was mainly confined to economic subjects, the investigations being carried on in mining regions along the proposed routes of new railways. No parties were sent into the less accessible districts to the far North, the idea being to advance gradually with exploratory work extending it systematically, northward. In all, twenty-four parties were sent out. The principal interest attaches to the work on the Yukon, in British Columbia, and in Alberta. The leading discovery of the year was that effected by the party in charge of D. B. Dowling, engaged in mapping the Rocky Mountains coal districts, by which the existence of a large coal-field extending northward from the Saskatchewan to the Brazean river was brought to light. Mr. Dowling's report states that these measures are raised much higher than those of the field south of the Saskatchewan and that all the formation can be got at either on the western slopes of the Bighorn range or in the gorge of Bighorn creek. Samples from a 16-ft. seam gave the following analysis:

Moisture, 2.50; volatile combustible matter, 27.10; fixed carbon, 64, and ash, 6.40; the fuel ratio, volatile to fixed carbon, being 2.36.

This is a good steam coal and probably of the best grade for coke. In view of its proximity to the transcontinental railway and of the scarcity of high-grade coals in the country to the east, this discovery is of great importance.

A considerable portion of the report of D. D. Cairnes, on the Yukon south of Whitehorse, is devoted to the anthracite and bituminous coal deposits of that region. Several seams of anthracite are located in an area known as Whitehorse, outcrop occurring 12 or 14 miles southwest from Dugdale Siding. A tunnel about 60 ft. long has been run on one seam and a few open-cuts made, otherwise the coal is entirely undeveloped. The general strike of the measures, which are quite regular, was traced for over 12 miles. Seams measured were 9 ft. 8 in., 10 ft. 4 in., and 2 ft., 6 in., respectively. Surface samples run high in ash but at a lower depth the ash will be considerably less. Its proximity to the Whitehorse copper deposits and the gold areas on the Watson and Wheaton rivers should render this coal valuable. The Tantalus mine on the west side of the Lewes river about 190 miles down from Whitehorse and about half way to Dawson, yields a bituminous coal giving an average of about 75% firm coherent coke. As the coal outcrops on the river banks it is well situated for economic working. The season's shipments were estimated at 7,000 tons. Two tunnels were in about 700 ft. in October. These measures are quite regular and can be traced for over 20 miles down the Nordenskiold river to the south and 10 miles to the north, showing an enormous amount of coal in the district. The same measures outcrop at Tantalus butte, across the river from the Tantalus mine. A considerable amount of coal has been shipped from Five Fingers mine eight miles north of the Tantalus, but the workings being dangerously situated, have been abandoned.

Mr. Cairnes examined the Watson and Wheaton River properties, where quartz carrying free gold and telluride minerals was found last summer. Within 90 days from the location of the first claim, the Gold Reef at Gold Hill, on June 25, 700 claims had been staked. Outcrops of quartz closely resembling each other are seen in almost straight lines at short intervals with the same general strike from the Watson river to within about 8 or 10 miles south of the Wheaton river, a distance of nearly 20 miles, and though most of the veins found were in this narrow belt about two miles wide, some deposits of pure stibnite and other minerals were discovered by the Survey party at a considerable distance to the west. In addition to occasional assays running as high as $300 a number of assays of from $20 to $60 were obtained in this district. With the exception of a small amount of work done on the Gold Reef, no attempt has been made to test the veins as yet. Taking into consideration the large quantity of mineralized quartz and the small amount of prospecting done, the results appear encouraging. On the Windy Arm properties a great deal has been accomplished with good results. A number of properties were worked continuously last winter and through the summer. The Pueblo copper property west of Whitehorse presents an enormous surface showing of copper ore.

R. G. McConnell and his party were engaged in measuring the volume and estimating the values of the high-level gravels in the Klondike district, but their work was not completed in time for the results to be embodied in the report. It is stated, however, that with 25 miles of proved dredging ground in the valley flats and tens of millions of cubic yards of workable gravels on the benches, profitable mining on the Klondike is assured for many years.

The work of delimiting the coal and copper areas of the Telkwa valley, in British Columbia, was assigned to W. W. Leach, who reported that as far as coal was concerned the task was one of extreme difficulty owing to the faulting and folding of the measures. It will require close prospecting before the extent of the coal areas is proved. Detailed information is furnished respecting the copper-bearing deposits of Hunter basin and other localities where claims have been staked. Charles Camsell, who was detailed for surveying work in the Similkameen district reports great activity in mining, laying much stress on large areas of low-grade ore. For many years the placers of the Tulameen river and its tributaries below Champion creek have been profitably worked for gold and platinum. These placers have been gradually exhausted and from being the principal producer of platinum on the North American continent the Tulameen river now supplies only an annual output of 30 or 40 oz. of that metal. With the revival of mining activity the production of lode-mining will probably be greater than the output during the best days of the placer miner.

A detailed report of operations at Rossland is presented by R. W. Brock. He states that during the past year development work has been pushed more vigorously than formerly, with the result that more ore is in sight in each of the mines than has been for a good many years. An examination was made of Franklin camp on the North Fork of the Kettle river, where many claims have been taken up. Mr. Brock reported that as none of the claims were past the prospect stage, and none of the workings had attained depth, it could not be definitely stated that another camp had been added to the British Columbia list, though there seemed to be a reasonable prospect that some of the properties might develop into mines.

The investigations of A. E. Barlow, who was engaged in tracing eastward into the Province of Quebec the formations containing the silver-cobalt-nickel ores of Cobalt had little practical result. The area examined covered five townships and an unsurveyed tract immediately east of Lake Temiskaming. It was found that while the formation was geologically identical with that of the Cobalt region, it is overlaid with clay strata and the quartzite and conglomerate of the Upper Huronian. The outcrops of the Lower Huronian conglomerate and slate are small and often widely separated, giving only a limited field for prospecting. No mineral finds of importance were made.

W. H. Collins reported the western portion of country along the Transcontinental Railway route as auriferous

and iron-bearing and worth the attention of prospectors. A strip along the line of the same railway eastward from Lake Abitibi was examined by W. J. Wilson who found molybdenite on an island in Seals' Home lake, and copper pyrite on the Harricanaw river and other points in Quebec Province.

Mr. Low in dealing with the season's work points out the disabilities under which the Survey labors on account of the inadequate means at its disposal. While the value of the mineral production is over six times as great as it was 20 years ago, the appropriations for the Survey and the Mines Branch of the Interior Department have only increased during this period from $115,053 to $173,553. The remarkable expansion of the Canadian mining industry and the vastly larger area to be covered seem to call for greater liberality to this useful branch of the public service.

Butte, Montana.

Small Copper Production in January.—A Local Exchange.—Smelter Smoke.—Gold From the Cable.—Prospecting in the Main Range. Exploratory Work in the Badger State and Gagnon Mines.—Butte & Superior.—Montana Consolidated.—A Lewisohn Enterprise. New Incorporations.

The January copper production will be the smallest of any month in nearly two years. The ordinary output of the Butte district was reduced 15 or 20% by the shortage of cars and fuel, and the cold weather. The extremely cold weather, which continued for more than two weeks, blockaded the traffic on the railroads and also froze the ore on the cars, so that it could not be unloaded after being transported from the mines to the smelter. The inability of the railroads to provide coal also compelled some of the mines and the Clark smelter in Butte to suspend operations.

The Butte Mining Exchange was opened last week and is now running successfully. The Exchange is rapidly establishing a value for many Butte stocks that heretofore were variously quoted and held at high figures by local brokers. The prices on stocks have averaged about as follows: Butte Copper, 94@95c.; East Butte Extension, 30@35c.; Butte & Milwaukee, 60@65c.; Amazon-Butte, $1@1.20; Butte Copper Exploration, $4.50@5; Butte & London, $2.50@2.75; Colusa-Leonard Extension, $2.50; Butte-Montana, 77@80c.; Butte & Bacorn, 45@46c.; Pittsburgh & Montana, $4.50@5; Reins, $1.15@1.20; Bullwhacker, $1.35@1.45; Barnes-King, $5@5.25; Cable Consolidated, 55@56c.; Snowstorm, $2.77@2.85; Stewart, $1.75@2; Raven, $1.05@1.15.

The significant fact was brought out a few days ago at the hearing on the alleged damage done by the smoke from the Washoe smelter, that President Roosevelt has taken an indirect interest in the matter. From the testimony of W. G. Weigle, a government timber inspector in the service of the Forestry Bureau of the Department of Agriculture, it appeared that the ranchers of the Deer Lodge valley appealed to the President to have a Government official look over the valley and determine the conditions as they apply to the timber growth on government land. The President directed the agricultural department to have the matter attended to, and the inspector was sent to Montana. He has been at work since last September, and has been summoned as a witness in behalf of the ranchers, who are seeking to shut down the big Washoe smelter. Thus President Roosevelt is assisting the ranchers in the prosecution of the Amalgamated company and the smelter. The inspector testified that he found the trees dying within a radius of several miles around the smelter, due to the smelter fume. He said he found thousands of trees that died last summer. This evidence of the Government official is recognized as very important to the ranchers.

A bar of gold worth $6,000 was brought from the mill of the Cable Consolidated Co. a few days ago and shipped to the United States assay office at Helena. The company is operating its 30-stamp mill, and in addition to treating a large amount of gold ore, it is making regular shipments of copper ore from the mine to the Washoe smelter.—The Butte Copper Exploration Co. has put in operation a large pump at the 1,000-ft. station of the Six O'Clock mine, and is now driving the cross-cut north as fast as possible. The face of the cross-cut is now about 520 ft. from the shaft. The company has purchased the Water Witch, north of the Six O'Clock, and is driving the cross-cut toward that property.

After many years mining men have started to explore the veins on the apex of the mountain range east of Butte. At a point 4½ miles east of Butte prospectors have developed an excellent showing of copper ore, and a company called the Butte-Continental has been organized to develop the ground more extensively. On one of the claims there is a vertical shaft 60 ft. deep near the foot-wall in a quartz-porphyry formation, while near the hanging wall another vertical shaft has been sunk to a depth of 108 ft., from which 300 ft. of cross-cuts have been run at the bottom. Between a depth of 30 and 50 ft. the shaft penetrated ore five feet wide, assaying at first 3% copper, but before the vein finally left the shaft on its southerly dip samples across the entire width assayed 8% copper, 12 oz. silver, and 40c. in gold.

Work on the Badger State shaft, which is being sunk by the Boston & Montana Co., is already down 125 ft. and the bottom is in granite. The shaft has three large compartments, and will be taken to a depth of 1,800 ft. before any cross-cutting work is done. The company has been satisfied that the big veins of the North Butte Co. pass through the Badger State. At present only a small sinking engine is in use, but as soon as the weather will permit the foundation for a large plant will be laid.—At the Gagnon mine of the Trenton Co. the shaft has been completed to a depth of 2,100 ft., and at that point a station is being cut. As soon as that is completed a cross-cut will be driven to the vein, which is near the shaft. The vein is not the Gagnon vein, but one that has dipped into the Gagnon ground from the Original It was found by the Gagnon at the 2,000-ft. level, and it was estimated that another 100 ft. in depth would bring it entirely within the Gagnon lines.—The Butte & Superior Copper Co. has purchased the Enterprise and Laura claims and has added them to the Blackrock group. The main working shaft is on the Blackrock, and it has reached a depth of about 570 ft. At the 500 some 3% copper ore was found, and the shaft will be taken to a depth of 800 ft. before any cross-cutting will be done. Captain A. B. Wolvin, president of the Zenith Iron Co., and other Duluth men of prominence, have secured control of the Butte & Superior Co., and Mr. Wolvin has been elected president.

The Montana Consolidated Mining Co. has been organized with a capitalization of $2,500,000 by Lewisohn interests to take over a lot of options on mining properties that have been held by the General Development Co. The latter has for six months been engaged in exploring the Brundy group of claims southeast of the city of Butte, and also owns the Granite Mountain claim, adjoining the Jessie of the North Butte Co. The Montana Consolidated will also take over the property of the South Butte, the latter being the mining corporation of the Great Northern Railway Co. that owns about 45 acres of mineral ground along the right-of-way of the Great Northern in South Butte.—Still another company organized during

the past week is the North Butte Summit Copper Mining Co., its purpose being to work seven claims situated five miles northeast of Butte in the Lost Child district. The incorporators are all Butte men. The company will drive an adit to cut the lode at a depth of 500 ft. The lode is a contact between porphyry and granite, showing fully 300 ft. wide on one of the claims. In sinking a shaft ore was found at a depth of 22 ft. that assayed 1.3% copper. This property is in the mountains and timber is plentiful.—— The Butte & Summit Valley Copper Co. is making rapid headway in the work of diamond-drilling, making about 30 ft. per day with the drill. The company owns 67 acres of mineral land near the Ida-Montana Co. It has two shafts, each 250 ft. deep, from the bottom of one of which the diamond-drilling is done.

London.

Gold Mining in Siberia.—Slump in Stocks.—Defective Titles.—Another Nerchinsk Company.—Report of A. L. Pearse.—Good News From Spassky.—Cornish Mining.—Vigorous Operations Promised.

Evidence is accumulating to prove that the Russian Empire offers both scope and safe opportunity for the remunerative employment of capital in mining enterprise. But nowhere is it more necessary to exercise discrimination and judgment as to the local conditions under which the operations can be conducted. It is also useful to bear in mind that in dealing with properties requiring development and the installation of efficient machinery and plant a considerable time must be allowed before profits available for dividends can be expected. For these and other reasons, such, for instance, as overcapitalization, readers of my correspondence will perhaps be less surprised at the severe slump which has overtaken the stocks of Siberian Proprietary and of its two offsprings, Orsk Goldfields and Troitzk Goldfields, than some operators in London who have gaily bought these shares on each upward move to the giddy height from which they have fallen during the last few days. In the words of a City editor: "It is years since any market in the Stock Exchange became so panic-stricken as did the Siberian mining market yesterday. Amid a scene of the wildest excitement and confusion the shares of the Siberian Proprietary Mines, Ltd., which quite recently were among the most popular of Stock Exchange and society gambles, fell enormously, taking down the shares of the two other companies of the group—Troitzk and Orsk—with them. The losses among some speculators must be exceedingly heavy. Such was the extent of the fall that whereas Siberian Proprietary shares opened at 14¾ for the one pound share, and 'made up' for the settlement at 14 during the morning, they closed no higher than 9¾, after having been down to 9½. Orsk shares fell from 2¼ almost to 1½, and Troitzk shares from 1⅜ to little over 1. The promoting power behind the group is the H. O. Syndicate, which derives its name from Mr. Heyman Orkin, who is managing director of each of the companies. The group of companies has shown much better results in company-mongering than in gold-getting, and attention has been drawn to the manner in which shares have been passed on to people in high society and their names used to induce others to come in." One explanation of the *debacle* relates to these companies' titles, which are said to be incomplete. On the other hand "capable and wealthy insiders" are supposed to have withdrawn their support from the market. In the hurly-burly, little notice is given to the absence of profitable mining results—the only "support" which is really essential to the continued stability of prices. In the perplexing circumstances now existing with regard to the companies in question the return of Mr. Orkin, now on his way from St. Petersburg, is eagerly awaited. It is thought he will avail himself of an early opportunity to meet the shareholders and re-assure them on the points now so fiercely discussed in the financial press. On the subject of Siberian titles it is interesting to note what the solicitors of the Proprietary Company have to say. From a letter these gentlemen have sent to the papers, it appears that so far as foreign companies are concerned, it is quite clear that, on obtaining the necessary license from the Russian Government, they are entitled to hold and deal in both movable and immovable property, including mining and mining rights, to the extent to which they are authorized by their articles of association. The obtaining of this license is purely a question of formality, provided the Russian Government is satisfied that the company is *bona fide*, but some time is required before the necessary formalities can be concluded. Pending the necessary license being obtained, foreign companies are entitled to, and do in effect carry on, business, and hold property both movable and immovable through the medium and in the name of attorneys, whether foreigners or Russian subjects, the only requirement being that such attorneys should act in their own name and have the necessary status of merchants of the First Class Guild. This statement, however, still leaves the stockholders in question in doubt as to whether, in their case, licenses have been granted by the Russian Government or not.

Having regard to the present aspect of the market it cannot be said that the word 'Siberia,' which heads the prospectus of Nerchinsk Options, Ltd., is calculated to be very helpful, although this flotation has been taken in hand by, and is an offshoot of, Nerchinsk Gold Co., Ltd., concerning which no doubt whatever is suggested as to titles. The area selected for the 'options' company is situate in the eastern part of the Nerchinsk mining district of Siberia, in the neighborhood of the property of the Kluchi Gold Mines. The company does not propose itself to work any of the properties that it may acquire, but to promote other companies for these purposes, in conjunction with the Nerchinsk Gold Mines. Prospecting work has already been done by the Nerchinsk Gold Company on the area included in the license to prospect, under the superintendence of that company's consulting engineers (Pearse, Kingston & Browne), and according to a report of Mr. A. L. Pearse on this area, dated November 21, 1903, the following are some of the discoveries: "Rich quartz float found above the line of some of the richest placers on the concession. The Eisenhut lode was found by costean trench on the west side of the Kostremyka creek. Its outcrop is 10 ft. wide, of gray quartz, and worth half an ounce per ton. The Twin is an outcrop of quartz 3 ft. wide, similar to the Eisenhut, farther up the hill. The discovery shaft is down 30 ft. on the hanging-wall side, and exposes 4 ft. of the lode-matter. The present value is half an ounce per ton. The lode is nearly vertical. The Growler is a lode 3 to 7 ft. wide, two miles up the stream from Koudechi. A shaft is sunk 20 ft. on the hanging wall. Its direction is N. 30° W. It is a promising-looking lode of white quartz, carrying pyrites, chalcopyrite, and a little lead. Two assays made of samples from here gave 11 dwt. and 5 dwt., respectively." It would appear from these particulars that further developments are necessary before these properties can be ready for offer to the public.

Some noteworthy particulars are available from the Spassky copper mine. In a recent cable Mr. Nelson Fell reports: "Returned tonight from Yuspenssky; development of last two months produced surprising results; believe no

exaggeration to say that reserves of ore are doubled." It is stated that the latest previous estimates of reserves were made by the consulting engineers in November last on the basis of the then price of copper, and were as follows: (a) Assured ore down to the 350-ft. level, 88,676 tons, containing 15,338 tons of recoverable metal estimated to yield a net profit of £80 per ton, or £1,227,040; (b) reasonably assured ore down to a further 100 ft. (of which 20 ft. had been sunk), estimated at a further 96,833 tons, containing 16,745 tons of recoverable metal, of an estimated net profit of £1,339,600. The total net profit value of ore actually or reasonably assured was thus calculated in November last at £2,566,640. When this company's establishment and installations (which are on a large and costly scale) are complete, those 'in the know' predict the commencement of a brilliant and lasting future for the mine.

Salt Lake, Utah.

Fuel Famine.—Better Railroad Facilities for Bingham.—Enlarging the Mills.—Railroad into Deep Creek.—Annual Report of Utah Copper.—New Mill at Garfield.—The Smelter Smoke Litigation.

The mine operators of Beaver county expect to get relief from the fuel famine within the next week and have received assurance from the coal and railroad companies that their demands for coal will be met. With the exception of the Horn Silver at Frisco and a few small properties, every mine in Beaver county has been closed for the past two weeks, including the Cactus properties of the Newhouse corporation. The Cactus mill has been provided with equipment sufficient to double its capacity.

The Rio Grande Western Railroad Co. has completed its second track into Bingham as far as the Utah Copper Co.'s mine. The Copper Belt railroad, upon which a majority of the producers at Bingham have depended to move their ores, has been unable for several months to handle the traffic coming to it.——The mill of the New England Gold & Copper Co., at Bingham, is being furnished with additional equipment. About 1,000 ft. of development has been done below the lower adit level during the past year, exposing enough ore to keep the mill going for two years. The plant is producing 12 cars of concentrate monthly, valued at about $600 per car.—— The negotiations looking toward a consolidation of the Standard Copper and Bingham Central mines have not reached a conclusion.

The management of the South Columbus Consolidated, at Alta, expects soon to make regular ore shipments. Two important veins have been recently developed in this mine, one of them assaying rich in copper and gold, and the other in silver and lead.

The Nevada Gold Butte Mines Co. states that in their Eureka Hill property a drift on the 80-ft. level has cut a lode showing pay-ore 28 in. wide. A sampling gave returns of $18.80 in gold. The property is near Gold Butte, Nevada. This, with other developments, justifies the erection of a small mill and a site for it has been secured on the Colorado river, about 1½ miles from the mine. Charles F. Porter of Keith block, Salt Lake, is the company's purchasing agent.

The construction of a railroad, to be a feeder for the new Western Pacific, will be built during the present year to provide transportation for the Western Utah Copper Co.'s mine in the Deep Creek district. The mine is in condition to produce heavily. A controlling interest is owned by F. Agustus Heinze and associates, H. H. Green of Salt Lake being the manager.

The annual report of Charles M. MacNeill, president of the Utah Copper Co., shows that during the last fiscal year the Bingham mill, notwithstanding that it was used largely for experimental purposes and was handicapped by poor railroad service, treated enough ore to bring an income of $246,785. From this sum was deducted the interest on the issue of first mortgage 7% bonds amounting to $52,500; the bonus of 5%, or $37,500, for the compulsory retirement on this issue, taxes, and extraordinary expenses amounting to $6,142, leaving a net income of $150,643. The first bond issue of $750,000 par value, bearing interest at the rate of 7%, was retired July 1, 1906, necessitating a bonus of 5%, or $37,500, under its terms. The new issue of first mortgage 6% bonds, aggregating $3,000,000, dates from January 1, 1906; $1,740,000 of this amount was called prior to July 1, 1906, with the balance available as needed. The company has under construction a concentrating mill at Garfield, in Salt Lake county, of 3,000 tons daily capacity. The initial unit of 1,500 tons will be ready about March 1 and the second unit about July 1. The ore to be treated will come from the Utah Copper mine at Bingham, which averages about 2% copper, with small values in silver and gold.

The ore shipments from Park City last week amounted to 1,278 tons, the contributing mines and respective amounts being: Daly Judge, 556; Little Bell, 37; Silver King, 473; Daly West, 200; Crescent, 12.

The annual election of the Silver King Mining Co. resulted in the election of the old board of directors, with David Keith as president and Thomas Kearns, vice-president and general manager.

The appeal in the smelter smoke cases has been filed in the United States Court of Appeals at St. Louis and will probably be reached by that tribunal about next July. These are the cases the trial of which resulted in the now famous decision of Judge John Marshall in which he enjoined four smelting companies operating in the Salt Lake valley from treating ores, or any combination of ores, containing over 10 per cent sulphur. The decision was rendered November 12, last, effective 30 days from that date. The smelting companies contend the damage to their business and to the mining interests of the State will be much greater than to the complainants if the injunction remains effective. The complainants are James Godfrey and 408 owners of property aggregating 9,000 acres of land near Salt Lake City, adjoining the plants of the American Smelting & Refining Co., the Utah Consolidated Mining Co., the United States Smelting Co., the Bingham Consolidated Mining & Smelting Co., and the Bingham Copper & Gold Mining Company.

Cripple Creek, Colorado.

New Hoist on the Theresa.—Tramway for the Cresson.—Good Ore in the Gold Sovereign.—British-American Dividend.—Treatment of Dump Ore.—Low Rate of Transport Secured.—Sinking the Portland Shaft.—Other News.

A new hoist has been installed at the Theresa mine of the Golden Cycle Co., on Bull hill. The output of the Theresa up to the present time has been hoisted through the Cycle shaft, which, together with the production of the latter mine, was more than that shaft could conveniently handle. The shaft on the Theresa will be sunk from its present depth of 1,000 ft. to connect with the raises being made from the 1,200-ft. level of the Golden Cycle. A large orebody discovered at this depth in both properties will be energetically worked to keep up a production of 4,000 tons per month.——Work is well advanced on the aerial tramway being constructed from the Cresson mine of the Bull Hill Mining & Development Co. to the broad-gauge tracks some 400 yards above the

mine on Bull hill. Delay and extra expense in hauling caused by heavy roads during bad weather convinced the management that a tramway whereby the ore could be transported direct into freight-cars would soon pay for itself, and save the company money. The output of the Cresson mine is in the neighborhood of 2,000 tons per month, averaging $20 in gold.

Three shifts of men are being employed sinking the shaft of the Gold Sovereign mine on Bull hill. The shaft is being sunk from the 800-ft. level to a depth of 900 ft., 30 ft. having already been done. Some of the best ore of the Sovereign has been obtained on the lower levels and when the shaft reaches a depth of 900 ft. it is proposed to do extenstve cross-cutting of the property. An electric hoist installed on the 800-ft. level is being used in the sinking. The output of the Gold Sovereign is about 30 tons per day, most of which is produced by lessees.—— The British-American Mining Co., Ltd., operating a lease on the Dante, has declared a dividend of $1,250. Work is being carried on through the Trail tunnel of the United Gold Mines Co. The orebody has now been opened up for a length of 150 ft. and regular shipments are being made. A car of screening settled for a couple of days ago, gave returns of $41 per ton, the bulk ore running a little better than one ounce. The Christmas Gold Mining Co. lease on the mine of that name on Bull hill and owned practically by the same parties as the British-American, has declared a dividend of $1,500. The ore on this property is rather low-grade, shipping around $15 to $20 per ton, but a good tonnage is being broken.

A compressor has lately been installed by J. M. Parfet and associates in the Moffat tunnel on the ground of the Lucky Corner claim of the Doctor-Jack Pot Co. The lessees will utilize the air for the operation of six to eight drills, and push development.——It is stated that the Little Giant Mining & Milling Co., operating a cyanide mill in Pony gulch, south of the city of Cripple Creek, has obtained a flat rate of 75c. per ton from the allied railroads for the transportation of ore from any mine or dump within the district to bins to be erected at the nearest railroad point to the Little Giant mill. Any mill in the district handling low-grade custom ores, it is understood, will obtain the same rate. The Little Giant mill should be now capable of running for several years, owing to the large number of dumps and mines, having low-grade orebodies, that are contiguous to the railroad. This concession will make the total cost of transporting ore from any mine or dump in the district, contiguous to the railroad, to the mill about $2 per ton, so that ores running from $4 upward can be treated at a profit.

The Portland Gold Mining Co. is considering the sinking of its No. 2 shaft on Battle mountain. The present depth is 1,100 ft. and it will be sunk another 100 ft.; then a drift will be run to connect with the winze from the 1,100-ft. level. Good ore was obtained for nearly the entire depth of 100 ft. in sinking the winze. An air-driven hoist is being used in sinking the shaft.

The pumps have recently been started up on the C. K. & N. property on Beacon hill. For over a year the water has been at the fourth level, but has now receded so that the fifth level has been recovered and is comparatively dry. The main vein of the property is being worked between the third and fifth levels and is producing fair-grade ore. The shaft is still 100 ft. deeper than the present water-level and the management may decide to pump to that depth in the future.

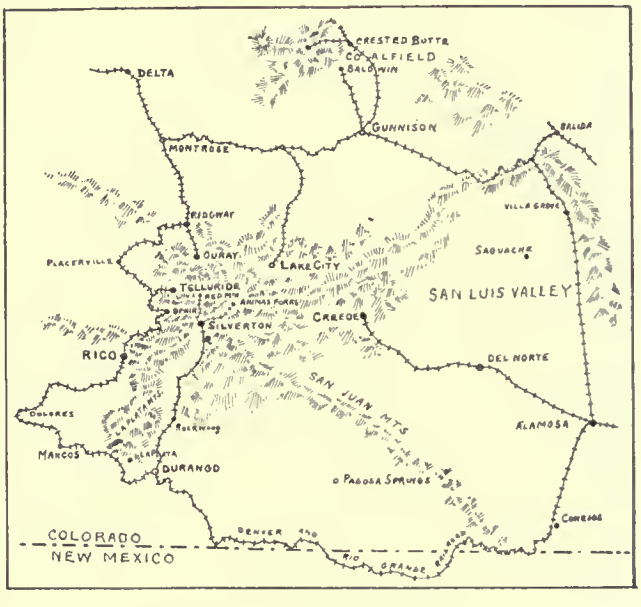
Thomas Dalzell, of Cripple Creek, has been appointed State Commissioner of Mines, in succession to E. Lyman White. The inspectors will be appointed after a conference between the Governor and the State Republican organization.

Denver, Colorado.

Guggenheim in the San Juan.—Activity Near Silverton.—The Saratoga Drained. — Resumption of Work. —Georgetown News.

Simon Guggenheim and associates have purchased 55% of the stock of the Mountain Queen Mining Co. This property is situated about three miles from Animas Forks. The Mountain Queen vein is one of the strong lodes of the San Juan region. Associated with Guggenheim are L. E. Hill, Fred Bodfish, and A. T. Holman. The bunk-house and ore-bins of the Mountain Queen were carried away by a snow-slide last fall, but will be replaced in the spring, and a tramway and mill will be erected. Several of the smaller properties in the San Juan region are making good progress and may develop into steady producers.

The Enterprise property on Anvil Mtn., two miles from Silverton, has recently shipped 100 tons of rich ore. A cross-cut tunnel is being run on this property, to cut the vein at a depth of 200 ft. The Thunder Mtn. tunnel



Map of Southwestern Colorado.

has cut the Aletha vein, at a point where it is 15 ft. wide, and contains pay-ore. The main shaft of the Edward-Ruth company which operates the Esmeralda mine, in Minnie gulch, is down 325 ft., and a large force of men is employed. All the buildings and machinery, which were broken down and crippled by the heavy snow-storms of last winter, have been repaired, and the entire mine equipment is in good shape. Shipments are made regularly to the Ross smelter.

The sixth and seventh levels of the old Saratoga mine have been drained of water by seepage into the long drift from the Newhouse tunnel, at Idaho Springs. It is estimated that 100 men can go to work at once in the ground unwatered. The entire mine will be drained in another 40 days if the water continues to recede as fast as heretofore. As soon as the mine is dry, a raise will be run from the Newhouse tunnel and the Saratoga will then be one of the biggest shippers in Idaho Springs or Central City. Ben T. Owens is the manager of the Saratoga.

The Mineral Chief at Georgetown is again a heavy shipper. This property is now owned by the Linn Consolidated Mining Co., which has just declared a 1% dividend. A tramway and mill will be built during the summer. A contract has been let to C. H. Fuller, of Idaho Springs, to drive the Lucania tunnel 1,000 ft. further.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

The mining outlook in Bisbee was never brighter than at the present time, and, although the last week in January has been a quiet one among the mines, only one new strike having been reported, still the share-market has been active and trading has been excellent. The shortage of fuel is still troubling the camp, but shipments are kept up to the standard. According to the latest report, the Calumet & Arizona company has ordered another furnace for its smelter, to handle the fast-increasing output of the Superior & Pittsburg, and the Copper Queen will also add another furnace to its plant. This new furnace of the latter company will be one of the largest in the world, and will be able to handle 1,200 tons of ore per 24 hours. The Holbrook shaft of the Copper Queen will soon be in working order again, and the output will be correspondingly increased. The Calumet & Arizona always keeps a reserve fund of from three to four million dollars on hand, and is extending its operations by bonding and leasing properties both in Sonora, and in other counties of Arizona. This company has recently acquired a large area of ground in the Twin Buttes section of Pima county, and has also taken a working bond on the old Mammoth property in Pinal county. The Guggenheims, it is reported, have secured a large tract of ground adjoining the Helvetia, and the Lewisohn Bros., of New York, own the Rosemont property near there.—— The Denn-Arizona is still the feature among Bisbee mines, and another good body of ore has been struck in the cross-cut being driven from the drift on the 1,000-ft. level.—— The Shattuck continues its usual shipments, and the stope between the 700 and 800 levels is still producing good ore.—— The diamond-drill hole of the Wolverine & Arizona is down 750 ft.—— The Cochise is cutting a station on the 600 level, and is stoping from the raise on the 300 level.—— The ore-bins at the Junction are nearly completed and shipping will soon start.—— It is reported that Jack Hoatson, formerly foreman of the Lake Superior & Pittsburg, has been appointed general manager of the company's interests in the Huachuca mountains.

YAVAPAI COUNTY.

An assessment of 5c. per share has been levied on the stockholders of the Black Rock company, near Congress. Work will be resumed at this property at once.——Owing to the scarcity of miners, the Goddard mine has closed down. The hoist will be kept in operation and the mine will be kept free of water, until more miners can be secured.——The Interior Mining & Trust Co. has received a shipment of heavy machinery, including a large engine for the mill, and engines and dynamos for the concentrator, pumps, and other machinery. The 100-ton mill will soon be in operation.

YUMA COUNTY.

The Felix Mahew mine, near the King of Arizona, is reported to have been recently sold to New York and Denver capitalists. The strike on this property was but recently made by Mahew, while searching for water for his burros. The purchasers are C. H. Fay and E. M. Rogers of New York City and R. K. Humphreys and F. N. Rogers of Denver, and the price is given as $300,000.

CALIFORNIA.

AMADOR COUNTY.

The Climax mine is being unwatered, and the 10-stamp mill will start at once.——Charles Levezz has a shaft down 80 ft., which is equipped with a gasoline hoist. The 5-stamp mill is running continuously.——The Liverpool tunnel is in 200 ft. and is expected to cut the Clinton lode in 20 ft. more.

INYO COUNTY.

A contract has been let to drive the adit of the Dunlap mine another 100 ft.——At the Black Canyon Co.'s property, work is progressing, and a silver-lead vein was encountered in the lower tunnel.——The mill of the Bullion company has started and is expected to run for an indefinite time, as a good supply of ore is blocked out. The shaft will be sunk to the 500-ft. level.——The annual report of the Casa Diablo Mining Co. shows that company to be in good condition. A second vein was struck by the adit, at a depth of 450 ft., and an upraise from a depth of 325 ft. to the surface exposed some good ore. Over 1,000 ft. of drifts have been driven, and the mill will be kept running continuously when it is completed.

MODOC COUNTY.

(Special Correspondence).—Interest is being manifested in the gold mines of the Hoag mining district, which was discovered a little more than one year ago, and several companies have been formed to develop properties. The nearest towns are: Fort Bidwell, about five miles from the northwest corner line of the State of Nevada, on the California side, and New Pine Creek, on the California and Oregon line. The country is easier to get into from the Bidwell side, a new road having been built last summer by the Mines Venture Syndicate, a Los Angeles company, from Bidwell to the mines.——There are several companies at work there. Among them are the Bidwell Discovery Gold Mining Co., and the Barret gold mine, operated by McCleary & Schauer, Colorado mining men. The Mines Venture Syndicate Co.'s properties are: The North Star company, and the Bidwell Consolidated company. There are several properties being developed by individuals, among them is the Turner, Williams & Mason property which has a good showing; they have nearly $6,000 worth of ore on the dump taken from a lode about six feet wide. The cut on this vein is about 20 ft. long and about 8 or 10 ft. deep. The lode can be traced by outcroppings, trenches, and open-cuts, for at least 500 ft. Assays have been made from this lode running well in gold.——Another good property is the Wade, Reed & Plummer. The principal values show in a large porphyry dike about 300 ft. long, and 160 ft. wide. This dike averages over $4 per ton, and several small stringers will run about $20 per ton.——Another property close by is known as the Laughlin, or Josephine. They have ore running about $20 per ton. The rock in the Laughlin shows free gold.——The claim known as the Kalfader and also the Barret shows some free gold, some of their rock assaying $200 per ton.——The Seitz copper mine, about six miles south of the gold belt, has a copper showing assays from which run from 6 to 80% copper. The country has an abundance of timber and water, and some water-power is available. The prevailing formations are porphyry, rhyolite, phonolite, and dacite. Iron and manganese are found with the ore, which is usually a porous sugary quartz. The climate is magnificent, the altitude of the mines being about 8,000 ft., and of the towns and valleys about 5,000 ft. There will be much activity in this field this year, as many of the properties are planning mills. No doubt there will be some ore shipped.——North of the Hoag district, across the Nevada and California line and about 40 miles from Fort Bidwell, there was another strike in August of 1906, in a place known as Windy Hollow.——The first strike was made on the Jumbo claim, owned by Loftus Bros. Several hundred people rushed into the district and many claims were located.——The general topography of the country is similar to Goldfield, Nevada, the formation being practically the same. Several companies have been formed and are operating in this district. Water and timber are not so plentiful in Windy Hollow as in the Hoag district near Bidwell, but it is only a few miles to water and timber. Many Tonopah and Goldfield people are in these districts. The way to reach this place is from Reno, Nevada, over the Nevada, California & Oregon Railway to Alturas, then by stage to Bidwell, one day's ride from Alturas. Then by stage from Bidwell to Windy Hollow, one day's ride. Or one can go on the Southern Pacific to Thrall, Cal., take the railroad then for Klamath Falls, then by stage to Lakeview, Oregon. It is 15 miles from Lakeview to the Hoag district on New Pine creek, and it is 30 miles from Lakeview to the Windy Hollow district. Stages run from all these places.

Fort Bidwell, Jan. 22.

PLACER COUNTY.

Vade Gooldsby is negotiating for the Mississippi mine, near Newcastle. This property has not been worked for 40 years.——The Peckham Hill tunnel is in 2,000 ft. and slate is the only rock encountered. If extended to Forest Hill, it will cross seven channels and 100 old tunnels. Many claim-owners will work their properties through this tunnel. The grade is about 75 ft. to the mile, and there is a good millsite at the mouth of the tunnel, and a mill will have to be erected, as the gravel is all cemented. It is estimated that over $40,000,000 in gold has been taken out of the mines in the vicinity of Forest Hill.

SISKIYOU COUNTY.

About 500 men are employed in the Blue Ledge copper country, near Hutton.——The Morrison & Carlock mine in Quartz valley has resumed operations, after a shut-down necessitated by the destruction of the power wires by the heavy storms.——The Lanky Bob mine on White gulch, in the Liberty district, and the Ethelyn mine, on Horse creek, are closed down on account of the cold weather.

TUOLUMNE COUNTY.

(Special Correspondence).——Good ore is being milled at the App mine, at Quartz. High-grade copper ore is being shipped regularly from the Golden City mine, situated near Cooperstown, in the western part of the county. The shaft, at present 250 ft. deep, will be sunk to 500 ft. Many years ago this mine was a profitable gold producer.——Operations on an extensive scale will soon be in progress at the Clio mine, near Jacksonville. Considerable surface work has been done during the past few weeks. It is thought the mill will be started by March 15.——A shoot of rich ore three feet wide has been uncovered in the Soulsby mine, at Soulsbyville. The new orebody was found in driving from the Pennsylvania shaft, at the 400-ft. level.——The sale to Denver people, of the Turnback mine, situated one mile north of Tuolumne, is reported. The vein is only a few inches wide, but assays show $31 gold per ton.——The company, which recently acquired the Dondero gravel mine and other adjoining properties, at Yankee hill, expects to begin hydraulic mining on a large scale by March 1. A boarding-house, bunk-house, blacksmith-shop, office, and other necessary buildings will be erected at once.——It is probable that the Tuolumne mine, situated north of Soulsbyville, will soon be in operation. It is said that in the early days it was worked profitably until water-level was reached, when it was abandoned. According to reports the last ore milled yielded $125 per ton, and the sulphides assayed $300. The average width of the vein is 12 inches.

The Stanislaus Electric Power Co. has contracted for the machinery for the 36,000-h.p. electric power plant to be situated 30 miles northeast of Sonora, on the Stanislaus river, in this county. The company has already expended an immense amount of money in constructing wagon roads, a railroad, sawmill and flume, and in doing other preliminary work. A reservoir having a capacity of one billion gallons will be built in Relief valley. It is expected that by the end of the present year the company will be ready to furnish electric power in this county and other parts of Central California.

Tuolumne, Jan. 28.

COLORADO.

CLEAR CREEK COUNTY.

The tunnel of the Capital Prize Mining Co. has been driven 4,200 ft. into Griffith mountain. Fifteen veins of greater or less importance have been crossed, but have not been prospected, as it was desired to reach the Etna vein without any delay. This vein has been opened quite extensively, and a good body of concentrating ore is said to be available.——The Two American Sisters Co. has about completed the extensive equipment that it has been installing. The new dam and power plant are completed, and the new mill, which is to work over the old dumps, is ready to run, and will have a capacity of about 50 tons per day. This is an old property, which has produced about $2,000,000. A good strike has been made on the 275-ft. level driven west from the Headlight shaft. J. J. White is the manager.—— A new strike is reported in the old Seven-Thirty mine. The discovery was made in running a cross-cut from the Hercules tunnel, at a distance of 3,000 ft. from the portal.—— J. M. Shaller, of Denver, has leased the Kaverne mill, at Dumont, and is installing a steam plant there. Ore from the Mammoth property at Silver Plume will be shipped here and treated in the mill.—— The lease owned by Nelson & Kermode on the Gold Dirt property of the Empire Tunnel Co. is in good shipping ore. Recent shipments have been made to the Denver smelters, and the concentrating material is hauled to the Empire mill.—— The Mineral Chief property, on Republic mountain, has started shipments of smelting ore. As soon as the mill located near the mouth of Moline tunnel is in running order, this property will send concentrating ore there.—— A lode has been intersected by the St. Paul tunnel, being driven into Green Lake mountain. The vein was cut at a distance of 1,150 ft. from the portal of the tunnel. The tunnel is headed for the St. Paul lode, which still lies 650 ft. from the face, and is supposed to be an extension of the Colorado Central.—— The new Nashatah mill, situated near the portal of the Diamond tunnel, is completed, and is concentrating the ores left on the old dumps of the Corry City, and Wisconsin mines. A tunnel has been driven under the Diamond tunnel dump, in which runs a belt conveyor. Onto this conveyor the ore will be fed from chutes, the belt conveying the material to the Huntington mill. Twenty Card tables have been installed, and no jigs will be used. The mill is run by electricity, and is said to be the best equipped and most modern plant in Clear Creek county.—— A syndicate of Denver men has taken over the Annie May group of claims, situated on Columbia mountain.

IDAHO.

IDAHO COUNTY.

A rich strike of ore is reported from the Hope property, which joins the Blue Ribbon property on the west. The values are free milling and the gold is coarse, with but few sulphides.——The Clearwater group of claims will be actively worked in the Spring. The property is on the Clearwater river, five miles from Elk City. A 100-ton plant will be erected at once, using an electro-cyanide process.

SHOSHONE COUNTY.

The silver-lead region of Idaho is enjoying the greatest prosperity the Coeur d'Alene district has ever known. Nearly every mine in the region has increased its working force, and now there are about 5,000 men employed, as compared with 2,500 one year ago. The eight-hour system is in use in both mines and mills, and $3.50 is the standard daily wage. The operators have paid over $6,000,000 to labor during the last 12 months. The following gives an idea of the distribution of this working force among the companies operating in the region: The Morning mine at Mullan employs 400. C. K. Cartwright is superintendent; the Standard-Mammoth at Mace employs 550 men under R. H. Pascoe, the superintendent; the Tiger-Poorman at Burke employs 200 men. J. F. Bergen is superintendent; the Hecla mine at Burke employs about 175. J. F. McCarthy is the general manager and Fremont S. Rowe, foreman; the Hercules has a force of about 200 men at its property up Gorge gulch, above Burke. Frank Franz is in charge, and Harry L. Day is general manager; the Frisco mine is being re-opened, and employs about 100 men at Gem. This number will be increased to 200 when the mill starts. Fred Burbridge is the manager; the Snowstorm, a copper property at Mullan, employs 250 men. Wilbur Greenough is the manager; the Hunter mine works 80 men, under James T. Gearon; the Success mine, producing lead and zinc, employs 75 men up Nine Mile creek, two miles above Wallace. The property is managed by H. F. Samuels. The Black Cloud, in Nine Mile cañon, employs 50 men under George Pressler; and the Tamarack & Chesapeake uses about 40 men. The Bunker Hill & Sullivan Co. at Wallace employs 500 men under Stanly A. Easton, the general manager; the Last Chance mine, below Kellogg uses 250 men under D. W. Peeples, the superintendent. In addition many men are at work in the hills, on prospects. It is estimated that 300 men find work outside of the producing mines near Burke; 500 men around Mullan; 500 near Saltese and Iron Mountain, Montana; 300 in the Murray district;

60 men in Government gulch below Wardner; 60 in the vicinity of Osburn, and 50 in Placer creek. Altogether, the Cœur d'Alene region is having a decided boom, new companies have been organized during the past year at the rate of one company every 67 hours, or 141 incorporations for the year, the stock exchanges are doing a big business, mineral production is increasing, and the mining industry is steadily undergoing a wholesome growth.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—A carload of hoists for mines in Crescent arrived at Nipton, Cal., several days ago. The Crescent-Searchlight, Superior-Nevada, Wathena, Golden Crescent, and Oro-Nevada all have machinery on the ground. Unknown parties are bonding the Calavada group, situated three miles south of Crescent. Five parallel veins are traceable on this property. The ore is similar to that found on the Tiger and Nippeno mines and assays of surface samples show values up to $36 in gold. All the properties in the Crescent and Searchlight districts have shown better values at depth than on the surface. The Crescent townsite is laid out on an almost level plateau in the heart of the district, west of the Searchlight valley and east of the Crescent hills. There is plenty of water available and the camp has a public school and library.——The Superior-Nevada company is developing its King Solomon mine, under the management of G. W. Huntington, and has 10 ft. of ore exposed, running from $8.20 to $23. The company will install the machinery necessary to sink to water-level. A shipment will soon be made, as there is some rich ore now on the dump. The shaft is all in ore at a depth of 135 ft., and the presence of galena is noted at this depth. Jas. Sword has started another shaft on the property, several hundred feet north of the present shaft, for water. The main shaft has attained a depth of 165 ft.—— H. H. McClure is working two shifts of miners on the Monte Cristo, adjoining the Shreveport and Colorado properties. A cross-cut tunnel is in 35 ft. and the management expects to intersect the vein at a distance of 110 ft. The country rock is porphyry and the values occur in the granite and porphyry contacts.——The Searchlight Gold Extraction Co. is sinking a shaft on the Jumbo group, with the intention of going down to water-level. The values found on the surface of this property are good and the management believes that they will encounter pay-ore at depth. On the Santa Rita claim, the vein has been prospected and stripped for a distance of over 100 ft., with the expectation of opening up an ore-shoot on the surface. The vein is five feet in width and the values average $13 in gold across the vein. The veins have an east and west trend and are at the contact of diorite and porphyry. This property is three miles south of Crescent and adjoins the Turquoise mine of the Tiffany syndicate.——Sinking is being accomplished on the Wathena mine of the Ajax Bullfrog Co. under the management of Geo. Straub. The shaft is on the vein, which dips at an angle of 45°. The lode is three feet in width, and some good ore has been produced. The values are increasing with depth, and, at the 175-ft. level, 18 in. next to the hanging wall runs $145 in gold and copper.

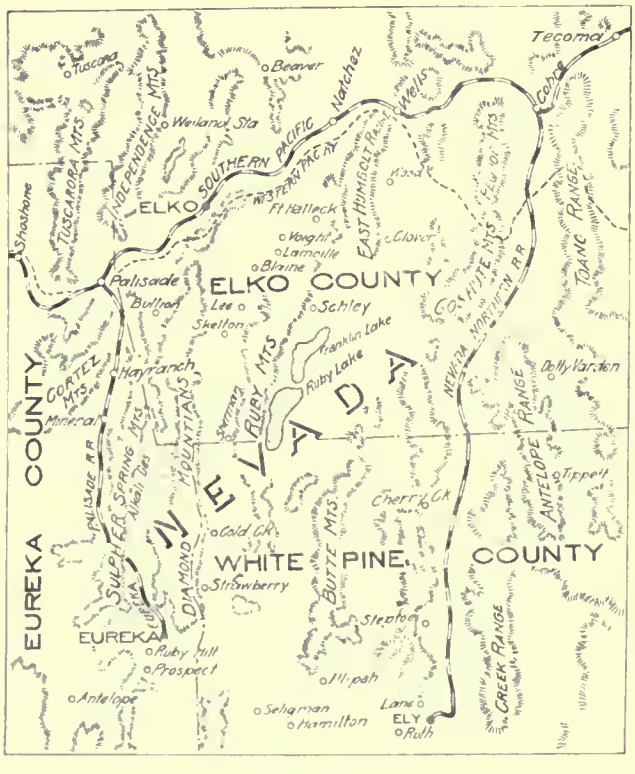
NYE COUNTY.

Rhyolite has formed a stock exchange, the organization has been incorporated, and the membership is limited to 200. The charter membership of 75 is entirely filled, and 50 seats will be on sale for the next 90 days, at $200 per seat. The list of officers and committees includes the following names: G. W. Thatcher, J. L. Cadogan, G. K. Vaughn, G. B. Keenan, O. O. Kincaid, and B. F. Taylor.——The work on the 400 level of the Montana Tonopah continues to uncover rich ore, some of which shows ruby silver. During January, 260 tons were shipped to Millers, but nothing was done with the ore, owing to the closing of the sampling works of the Western Ore Purchasing Co., on account of lack of fuel. The new 40-stamp mill is ready for the roof, and all the machinery is on the ground.——It is announced that C. M. Schwab has purchased the Brown Palace group of claims, at Rosebud. Wingfield & Nixon and T. L. Oddie are also said to have secured ground in this district.

OREGON.

BAKER COUNTY.

(Special Correspondence).—About 30 miles southeast of Baker City, there is a revival of interest in placer mining similar to that of 40 years ago. Burnt river and its tributaries have long been noted for their placer gold, but the supposition has been that the richest diggings in that vicinity were exhausted. On Clark creek, which empties into Burnt river, there was in the early '70s a camp of 2,000 people, engaged in extracting gold from the bed of that stream. Later, the camp disappeared.——It now appears that the old channel from which hundreds of thousands of dollars were taken, has been re-discovered, and Richard Eckman, acting for John L. Rand and W. H. Packwood, is driving a tunnel to tap it. This adit is already in 250 ft. and the men expect to strike bedrock any day.——Great interest in placer mining is centered in the Cornucopia district, about 40 miles northeast of Baker City. On one of the tributaries of Eagle



Map of Eastern Nevada.

creek, which was once noted for its rich diggings, another old channel has been discovered. One tunnel has tapped this channel at bedrock and the gravel which is now being taken out yields $5 per cu. ft. The gold is coarse. What is known as the Blair, Herbert & Underwood property, was the first on which a tunnel was driven to this old channel, and in the rush which followed the ground was taken up on both sides of them, and other tunnels are now being driven. Charles Slade, Jos. Cooley, and Lincoln & Hunt, are among the locators, and they are driving toward the bedrock of the old Boulder creek channel. The estimated distance they will have to drive is 60 feet.——An important deal is the transfer of the North American Mining Co.'s property, at Burkemont, to a New York corporation, under bond, for $1,500,000. D. W. C. Nelson, the general manager of the North American, has just returned from New York. At the stockholder's meeting, which was held in Des Moines, Iowa, on the eighth of January, the sale was confirmed. The New York parties will begin work on Feb. 7. This property is one of the most prominent on the copper belt here. Nelson will be retained as superintendent and development work will be started on this property at once.

Baker City, Jan. 26.

JACKSON COUNTY.

The Lakeview Co. has made a new strike in the Coyote hills. The lode, as opened, assays one ounce per ton.—— The Briggs mine, together with the Forest and Blossom groups of claims, situated some 30 miles northwest of Ashland, has been taken over by a syndicate of Amsterdam.

Personal.

W. S. NOYES is in Texas.

HERMANN A. KELLER is at Planet, Arizona.

MARK L. REQUA has returned to San Francisco.

G. A. DENNY has been examining mines at Butte.

ARTHUR L. WALKER has arrived from New York.

FREDERICK H. HATCH has returned to London from Siberia.

GEORGE W. MAYNARD has returned to New York from Mexico.

H. C. CALLAHAN has been at Denver and is now in Nevada.

C. W. PURINGTON sailed from Boston for London on January 23.

WILLIAM BAYLEY, of Los Angeles, has been on a visit to San Francisco.

GEORGE J. BANCROFT is examining mines at Cherry Creek, Nevada.

HAROLD WILSON has opened an office at Denver. His address is P. O. box 243.

W. R. RUST and EDGAR NEWHOUSE, of the A. S. & R. Co., are in San Francisco.

WILLIAM RUSSELL, of Denver, is examining mines in Madera county, California.

MAURICE M. JOHNSON is accompanying Samuel Newhouse on his visit to Cobalt.

ERNEST BAMBERGER is now general manager of the Ontario & Daily mines, in Utah.

E. A. H. TAYS postponed his trip to British Columbia and has gone to Bullfrog, Nevada.

A. D. BENTON has been appointed manager of the Paymaster mines, near Tucson, Arizona.

WILBUR E. SANDERS recently examined some prospects in the Greenwater district, California.

A. M. ANTOINE has received an appointment with the Brazilian Concessions, Ltd., in Brazil.

J. H. ROBESON, of Silver Plume, Colorado, has been appointed manager of the Nipissing mine, at Cobalt.

SAMUEL NEWHOUSE has gone to Cobalt, Ontario, in his capacity as president of the Nipissing Mines Company.

RICHARD R. HEDLEY has resigned as manager of the smelter of the Hall Mining & Smelting Co., at Nelson, British Columbia.

W. A. WALKER, of Mt. Pleasant, Ohio, has been appointed manager for the Gold Dust-Puzzle mines at Breckenridge, Colorado.

JAMES W. MALCOLMSON is leaving El Paso and will reside at Kansas City. He has been appointed general manager for the Stilwell companies.

H. A. BARKER, formerly receiver of the Golden Cross property at Hedges, is at Metcalf, Arizona, in the interest of the Crawford Gold Mining Company

CHARLES C. GATES, former superintendent of the French Mountain Mining Co., at Red Cliff, Colorado, is now superintendent of the Nevada United Mines Co., at Ely, Nevada.

P. L. WILLIAMS, JR., who has served the Utah Consolidated Mining Co. at Bingham as superintendent of the Highland Boy mine, has resigned and has accepted the position of general superintendent of all the mines under the general management of ERNEST BAMBERGER of Salt Lake. These include the Daly West, Daly, Ontario, and Naildriver mines at Park City and the Ely Witch at Ely, Nev. Mr. Williams has been succeeded at the Highland Boy by MIKE RHINEY, of Butte, Montana.

Obituary.

CAPT. T. F. SINGISER, formerly delegate to Congress from the Territory of Idaho, who was identified with mining affairs in the Salmon river country, and organized the American Flag Mining Co. at Park City several years ago, is dead. He had been an invalid for the past year.

California Miners Association.

W. C. Ralston, president of the California Miners Association, has announced the following executive committee: Charles G. Yale is chairman; the other members are E. B. Braden, S. W. Bradley, Ross E. Brown, R. Gilman Brown, Frank H. Buck, A. Carrigan, S. B. Christy, Thomas Clark, Edward Coleman, C. W. Cross, A. Hamilton, J. J. Hamlin, J. D. McGilvray, B. M. Newcomb, T. A. Rickard, Louis Rosenfeld, Louis Sloss, George W. Starr, George Stone, and Lewis T. Wright.

Every mining interest of the State has representation on the committee, including copper, quicksilver, smelting, oil, cement, building stone, and dredge mining. The officers of the Association are W. C. Ralston, president; C. H. Dunston, vice-president; John Hendy, treasurer.

Trade Treatises.

ALLIS-CHALMERS Co., of Milwaukee, issue Bulletin No. 1,045, describing rotary converters.

A. LESCHEN & SONS ROPE Co. publish a handsomely illustrated book on the 'St. Louis of Today.' On one of the pages their own large establishment is pictured.

SMITH, EMERY & CO., of San Francisco, issue a pamphlet detailing the work they perform, which includes physical tests, inspections, factory processes, water rectification, and analyses.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, January 31.

Brunswick	$0.75	Standard	$3.10
Con. Virginia	0.95	Savage	0.92
Mexican	0.95	Sierra Nevada	0.64
Ophir	2.75	Yellow Jacket	0.93
Belmont	5.25	Montana	3.95
Jim Butler	1.25	Mohawk	17.50
Jumbo	4.25	Red Top	4.05
Jumping Jack	0.28	Sandstorm	0.74
Manhattan Con	0.93	Silver Pick	1.43
Midway	2.10	Tonopah Ex	5.25

METAL PRICES.
By wire from New York.

	Average prices for week ending— January 21.	January 31.
Copper—Lake (cents per lb)	24⅜@25	25 @25.29
" Electrolytic "	24⅜@24¾	24⅝ @25.94
" Casting "	24¼@24½	24¼ @24½
Lead "	6	6
Spelter "	6.70@6.75	6.70 @ 6.75
Silver (cents per oz.)	68⅛	67¼

ANGLO-AMERICAN SHARES.
Cabled from London.

	January 21. £ s. d.	January 31. £ s. d.
Camp Bird	1 8 6	1 8 6
El Oro	1 5 6	1 5 6
Esperanza	2 17 0	2 18 3
Dolores	1 7 6	1 11 3
Oroville Dredging	1 0 6	1 0 6
Stratton's Independence	0 3 9	0 3 3
Tomboy	2 1 3	2 3 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Jan. 24.	Jan. 31.
Bingham Central	2	1¾
Boston Copper	31¾	30
Calumet & Arizona	183	184
Cumberland Ely	13	12½
Dolores	8½	7½
El Rayo	6½	6½
Guanajuato Con	4⅞	4¾
Giroux Con	9⅞	9⅜
Greene Con	31⅛	30¼
Nevada Con	18½	17½
Nipissing	13⅛	11⅞
Tennessee Copper	49½	47½
Tonopah Ex	5⅜	5¼
Tonopah-Belmont	5¾	5¾
Tonopah	18¼	18¾
United Copper	73½	.....
Utah Copper	40	38

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BLACK SAND is often a mixture of the magnetic oxide of iron, magnetite, and the iron-titanium oxide, ilmenite or 'menaccanite,' as it is sometimes called. The last mineral resembles magnetite, though its magnetic quality varies greatly. The best test for ilmenite is to boil some of its powder in strong hydrochloric acid, and then add a piece of metallic tin and boil to small bulk. The titanium in the mineral will impart a fine violet color to the solution.

CALCITE AND ARAGONITE have the same chemical composition, namely, carbonate of lime. Aragonite is of rare occurrence compared to calcite, yet some marbles, especially the banded and stalactitic kinds, are really this mineral, and not calcite. A test not generally known that will distinguish them, is to boil a little of the powdered mineral in a solution of cobalt nitrate. The real color of the solution will remain unchanged with calcite, but with aragonite it will change to violet.

LUBRICANTS are tested in about six ways: (1) By chemical analysis; (2) for specific gravity; (3) for relative viscosity when new; (4) for gumming action; (5) for flashing and burning points; (6) generally, by the testing machine. The last is the most efficient, and in its essential features consists of a pendulum hanging on the test journal, whose brasses can be adjusted for any pressure by a screw. The journal being rotated to the right, the pendulum moves to the left, and a scale at once indicates the friction per square inch of journal.

UNDER the more recent systems of rock nomenclature, the terms rhyolite, liparite, and quartz-porphyry, are grouped together as interchangeable. As a matter of fact, the name 'rhyolite' is directly derived from the Greek word meaning 'to flow,' and perhaps this term should be applied to that class of eruptive rocks which typically shows some evidence of flow structure, the term quartz-porphyry covering the remainder of the class. Liparite is a term little used, having its derivation from the Lipari islands, near Sicily, where this rock is much in evidence.

THE average eastern slope of the Rocky Mountains seldom exceeds 10 ft. per mile, which is about one foot in 500, equal to an angle of only seven minutes. On the west the average slope is but little less gradual. The rise on the east continues for 600 miles, and the fall on the other side for nearly 500 miles. The mountain mass, therefore, is not a narrow barrier between the east and west, as might be inferred from the ordinary maps, but a vast, gentle swell of the surface, having a base 1,000 miles in breadth. In the Sierra Nevada, the western slope is the gentler, being between 100 and 250 ft. per mile, and the eastern, for a large part of its length, 1,000 feet.

THE mean height of the continents above the sea has been estimated at nearly 1,800 ft. The mean height of each is stated as follows: Europe, 975 ft.; Asia, 2,880; North America, 2,000; South America, 1,750, and Africa probably about 2,000 ft. The mean height of the United States, Alaska excluded, is 2,500 ft. Colorado is the highest, averaging 6,800; Wyoming second with 6,700, and Utah third with 6,100 ft., while Delaware only averages 60 ft. above sea-level. The lowest spot in the United States is Death Valley on the southeast border of California, which descends 480 ft. below the sea-level, and is bounded on the east by the Funeral mountains, 7,000 ft., and on the west by the Panamint range, 11,000 ft. high.

IN the working of toothed gears, the smoothest action being observed to occur when a very small pitch was used, Dr. Hooke invented his 'stepped gearing' to obtain strength and smooth action at once. These are made use of in many of the big engines, both hoists and compressors, at the Calumet & Hecla mine. A further development in gearing brought in the 'single helical' gearing, which simplified the casting. And this in turn was followed by the 'double helical' teeth, now so common, which have been adopted to avoid endlong pressure on the bearings caused by the single helical teeth. They are machine moulded from two half patterns, and work smoothly if well formed, and are said to be stronger than ordinary teeth.

WHEN air is compressed into a smaller volume, if the temperature remains constant, the pressure increases directly in proportion to the decrease in volume; that is, if the volume is one-half, the pressure will be doubled; if one-third, the pressure will be trebled, and so on for any decrease in volume. There is, however, another and most important factor in the problem that must be considered in all cases except the lowest terminal pressures, namely, the increase in temperature and consequent increase in volume due to the heat developed during compression. When air is compressed, the work done during compression is converted into heat, which must be taken up by the air compressed, the result being to raise its temperature and increase its volume, thus adding largely to the work required to be done.

MOLYBDENITE AND GRAPHITE are two minerals that closely resemble each other, especially when they are disseminated as small flakes in a rock. They are both soft and have a greasy feel, and they occur in various ways from minute scales to large foliated masses. The larger flakes can readily be told apart by the color as molybdenite is bluish lead-gray, while graphite is dark steel-gray to dull black. However, when either occurs in small specks or particles in a rock, the color cannot always be judged. One of the simplest tests is to mix some of the rock powder containing the mineral with potassium nitrate on a thin piece of platinum or tin and apply a flame beneath. Graphite will deflagrate, that is, will burn with miniature explosions like grains of gunpowder, whereas molybdenite will remain unaffected. Very small amounts of graphite in a rock can be detected by this method.

INFUSORIAL earth and tripoli include all porous siliceous earths, composed of organic fragments, such as infusoria or diatoms, which have accumulated either on ocean bottoms or in ponds. Such deposits are quite common in the coastal plain area of Maryland, Virginia, Georgia, and Alabama, where they form beds several feet in thickness, generally interstratified with the Tertiary sands and clays. Deposits in Missouri are different in their nature, consisting of the residual silica left by the leaching of an impure limestone. The largest and best known deposits are those in northern Germany, where they are found from 15 to 18 ft. below the surface in a bed varying from 18 to 45 ft. in thickness. This is exported to all parts of the world. Infusorial earth and tripoli are used chiefly for polishing powders and scouring soaps, while their porous character makes them valuable as an absorbent for nitro-glycerine. As a non-conductor of heat they are of value for steam-boiler packing, for wrapping steam-pipes, and for fire-proof cement. The tripoli of Missouri is used for water-filters.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Amalgamation of Copper Ore.

The Editor:

Sir—In your issue of October 20 there is an article on 'The Amalgamation of Copper Ore' by Arthur H. Keller, of Honduras. This article comes to me like an echo of twenty years back; in 1886 I was a subscriber to the MINING AND SCIENTIFIC PRESS, and was looking for silver ore in a district of Montana where the formation was presumably Carboniferous limestone. Silver was at that time all the go, and the great Granite Mountain mine in my neighborhood was beginning to yield its wealth. The ore in my locality was a gray copper (fahlerz) and a black mineral (likely polybasite), which some of the miners called a copper-silver glance; some of these minerals were oxidized, forming an ore as Mr. Keller describes.

In the gulch, James Hamond was running an arastra on this ore, using what he called Aaron's process; at that time freight and treatment were $40 per ton. Mr. Hamond had learned Aaron's process somewhere in Nevada. In the advertising columns of your paper I saw a book entitled 'Testing and Working Silver Ore' by Charles Howard Aaron, who was then an able and conscientious metallurgist of the Pacific Coast; in it Aaron describes his process minutely; it consists in grinding the ore in an arastra or some other way, an arastra preferred, wet, making a pulp of the consistence of mortar, heating by introduction of steam to boiling point, then adding 5 to 10% common salt and from 5 to 20 lb. bluestone per ton of ore. After being heated and the bluestone and salt added, the barrel is revolved for an hour or two; next the mercury is added, and scrap copper (or copper balls or copper bars) fastened lengthwise in the amalgamating barrel is introduced; after from five to ten hours revolving, the amalgamation is finished. This process cannot be used in an iron amalgamating pan, as the copper sulphate and chloride are decomposed by iron, and not only is it destroyed, but the copper enters the silver amalgam, making it base. Usually Aaron's process yields a retort of 0.925 to 0.950 fine, and no loss (or only a small one) of quicksilver. James Hamond told me that he lost one-half to three-fourths the bullion weight in mercury, that is, 50 lb. mercury to 100 lb. bullion, including all losses; careless work, I considered it. In the book of Mr. Aaron, he mentions a German metallurgist who came to Virginia City to introduce a process called the 'Dichloride of copper process', but the companies did not take it up and Mr. Landswirth, the inventor, left. The dichloride of copper, which is cuprous chloride, Cu_2Cl, is made by boiling bluestone, salt, and metallic scrap copper together, the proto-chloride of copper which forms from bluestone and salt, CuCl, being reduced by the metallic copper to the sub-chloride, Cu_2Cl, a white powder soluble in salt brine. This was the active agent in Aaron's and Landswirth's processes.

I experimented with Aaron's process with the ore described and extracted from 85 to 93% on ore carrying 25 to 40 oz. silver per ton; the tests were made on two and a half pound lots. I also tried rich ore 400 to 500 oz. Ag per ton, got about 80 to 85%, which, of course, would not do, for it left 75 to 100 oz. in the tailing. I made one test on low-grade ore with Landswirth's dichloride process; the result was as satisfactory as Aaron's process; I then tried copperas, the cheaper iron sulphate ($FeSO_4$), a little sulphuric acid, salt, and metallic copper; the result was good when there was plenty of green and blue carbonate in the ore; with ore having no oxide or carbonate—only sulphides of copper—the iron sulphate is useless.

The conclusion I arrived at was that in these processes sulphate of copper is necessary, first, to furnish Cu for the formation of CuCl, the sulphuric acid content of the bluestone being required to decompose the salt to liberate the chlorine. Metallic copper is necessary to reduce proto-chloride of copper to the sub-chloride, to reduce the silver chloride to metallic silver, and to protect the mercury. Metallic iron is tabooed. After separating amalgam from pulp, pulp can be run into an iron settler.

In ore having carbonate and oxides of copper, sulphuric acid and copperas can replace part or all of the bluestone.

WM. H. BAUR.

Valdez, Alaska, December 17.

Single-Stamp Mills.

The Editor:

Sir—The contribution of Mr. Algernon Del Mar with reference to single-stamp mills and consequent economy in milling practice, which appeared in your issue of November 17, and a subsequent article on the same subject by Mr. F. L. Bosqui, have interested me very much. I am indeed glad to read any expressions of experience on this question by competent engineers for there can be no doubt that it is a serious and important one and richly deserves careful attention.

I myself have been deeply interested in the tests recently conducted by the Boston Con. Copper Co. in Utah, and the results obtained there have opened my eyes to the possibilities of the single-stamp mill as compared to the old five-stamp battery. I have been positively assured by the manager of the Western Zinc Co., in southern California, who is a disinterested, competent, and reliable engineer, that this make of stamp is now crushing in their mill 10 tons of ore per 24 hours, per stamp, as against less than 3¾ tons per stamp in the old style of five-stamp battery of 1,000 lb. each, and to my certain knowledge, the results obtained in Utah are even better than this. The rapid and ready discharge, which is the chief object of this design, also produces less sliming, in itsef a feature of no small consideration.

Such results, as here quoted, might undoubtedly vary materially according to the character of the rock crushed and other attending conditions. Perhaps many of the low results in Nevada, as mentioned by Mr. Bosqui, may be due in a great measure to incompetent handling, as such is too often the case in the initial use of new devices. But when figures are obtainable from work performed by both kinds of stamps, side by side, under exact conditions, there is but little, I think, to prevent a just opinion.

In any event, I fear it will be difficult indeed for the vast majority of gold-mill men, particularly in California, to look with any respect whatever upon a mill of this character, because of their pet hobby of battery amalgamation. In my opinion, the single-stamp mill as put on the market today, is not at all adapted to that work, although the actual crushing capacity may be excellent. Nevertheless, such a vast saving in crushing as this mill promises to make, is entirely too important a consideration to be allowed to pass unnoticed, and I am glad to have this opportunity to add my little quota to the discussion.

The advent of the single stamp is bound to force the question: Is not the general cost of gold milling kept unnecessarily high, and the advancement and development of good practice retarded, as a consequence of sticking to the old custom of battery amalgamation? I admit that in some special cases, battery amalgamation may be

best. But from a varied experience of some twenty-two years, I myself, whenever opportunity permits, have invariabiy tried both inside and outside amalgamation, and have yet to find any advantage to be gained by the former. I am sure that most millmen do not understand the subject as they should, but religiously adhere to a custom, simply because it was practiced by some one before them. It must be admitted that economy in crushing may be looked for through the use of the single-stamp mill. Therefore let us take up a new arrangement of the mill throughout: In the old days all gold milling was 'free-milling,' otherwise there was no milling at all, as the proverbial Irishman would say. There was but little, if any, concentration and consequently the plates were placed under the lip of the battery, or against the battery itself. As concentration came into fashion, the machinery for this operation was placed at the tail end of everything, a matter then of no great importance, and this arrangement has been allowed to stand until the present day. But concentration has now come to be the most important feature in milling, more especially with respect to gold. Investigation shows that it is possible to move the concentrator further to the front to take the place of the plates nearer the battery, and with better results and greater economy.

Under any circumstances where concentration is employed, classifying or sizing of pulp is as necessary as any other feature of milling. No matter how fine the ore may be crushed in the mill, the pulp should be classed into at least three products, the coarse, the middling, and the slime, the latter containing particles that do not settle easily in water under agitation. He is indeed a poor millman, who cannot devise a sufficiently effective sizer with the aid of his carpenter and a little gas-pipe. But there are a number of cheap machines on the market and the purchase of one would be a profitable investment. I am aware that there are superintendents who do not regard with any favor sizing of their pulp, because, as they claim, they are crushing fine enough, yet their tailing contains value. Soft amalgam and quicksilver will escape with the tailing from concentrators, but the segregated particles of free gold will not. Any piece of free gold that will stick on a plate, will stay on the concentrator. If such a piece of gold would not stay on the concentrator, it would not stick on the plates.

With all these facts established, the arrangement of the mill should be as follows: Stamps, sizer, concentrator, slime-tables, plates.

Three-fourths of the lost amalgam and quicksilver from the plates is caused by the quicksilver escaping from the battery. The discontinuance of battery amalgamation is an economy in this case, and a further point is that the proximity of the plates to the battery causes a constant vibration that is exceedingly detrimental to good amalgamation. The waves flowing over the plates in gushes from each succeeding drop of the stamps, cause a varying rush on the surface, which prevents close amalgamation of the lighter particles. By removing the plates to a quieter locality below the concentrators and slime-tables where the product from these last may be passed over them with an even and well-regulated flow, the results would be better. For instance, the plates of a 40-stamp mill may be reduced from eight to two or three, the coarse concentrate to pass over one, the middling on another, and the product of the slime-tables on the third; and in this way, the grade of each plate may be adjusted to suit conditions favorable to good work.

In a great many cases ores contain various oxidized and other materials that have a tendency to foul the plates and thus cause loss from imperfect amalgamation. But this fouling substance would be eliminated in this way, the detrimental element having gone into the tailing, and a comparatively clean product passed over the plates. With this arrangement there should be no loss of amalgam and a close saving throughout the mill; if any amalgam should possibly escape the plates, it would go directly into the concentrate.

J. W. PINDER.

San Francisco, January 11.

Increasing Milling Capacity at Small Cost.

The Editor:

Sir — In 1900, Charles Tozer and C. D. Lane, of San Francisco, built a 10-stamp mill to treat the ore which was being extracted from a rich shoot in the Eureka mine, one of the claims now owned by the Bonita Co., in Whatcom county, Washington. The ore occurs in irregular bodies situated on the hanging-wall side of a fissure, which has a northeasterly strike through Cretaceous shale. No ore has been found in this fissure, but in the shale, which has been shattered, large bodies of ore from 12 to 60 ft. in width have been developed. The orebodies are intermixed quartz and shale. The company determined to increase the capacity to at last 200 tons per day. My attention having been called to an article, written by J. A. Wauchope, regarding slow-speed mills, the directors at my suggestion determined to install one of these mills to do the fine crushing and amalgamation, using five of the stamps as a secondary crusher. By making this test side by side, the results would enable them to determine the merits of the two systems and to form a correct judgment regarding machinery to be installed in the future. I think the information acquired from this test may be of interest to some of your readers, and therefore give a brief description of the results obtained.

A 10-ft. Lane mill was placed in front of one of the batteries, consisting of five 1,000-lb. stamps, making its intake low enough for the pulp from the battery to be delivered to it by gravity. A quarter-inch mesh No. 16-wire screen was put on the battery and the stamps were given a 6-in. drop with a 4½-in. discharge. The Lane mill was fitted with 8-mesh wire-screen and 6-in. discharge. The pulp from the mill was discharged to plates five feet wide, 18 ft. in length, and then to two Wilfley concentrators. The other battery of five 1,000-lb. stamps had a 6-in. drop, with a 5-in. discharge through a 25-mesh wire-screen, and the pulp was run over plates five feet wide and 20 ft. long, and then over one Wilfley concentrator. Hourly samples were carefully taken from the batteries (at the foot of the plates), and from the concentrators, for three days. Samples showed the saving to be:

Stamp system.	From foot of plates.	Lane system.
51%		65%
	From the Wilfley tables.	
80%		91%
	Screen test of tailing.	
90% passed	30 mesh	96%
70 " "	40 "	88 "
42 " "	60 "	66 "
36 " "	80 "	56 "
11 " "	100 "	36 "
	Screen tests of concentrate.	
97% passed	30 mesh	99%
89 " "	40 "	96 "
58 " "	60 "	92 "
51 " "	80 "	88 "
22 " "	100 "	80 "

The product from the stamps, when examined by magnifying glass, shows sharp edges and angular shapes. The re-ground product has rounded edges and globular forms. It is evident that the re-grinding process of the Lane system makes a product by abrasion that is entirely different from that of the stamps, and, in my judgment, it is better for amalgamation.

The Lane mill made six revolutions per minute and

crushed 40 tons per day of 24 hours, while the stamps dropping 96 times per minute crushed 16 tons with 25-mesh screen. The power required to drive the Lane mill with full load is 12 h.p. Judging from the present wear on tires and track, which have been in use six weeks, I estimate the cost of repairs will not exceed three cents per ton of ore crushed. The hardness of the ore we are crushing is above the average. By increasing the speed of the Lane mill from six to eight revolutions per minute, which we are going to do, I feel confident that the mill will crush at least 50 tons per day.

The cost of installation, ready to run, did not exceed $3,500. Had we installed ten more stamps, the cost would have been about $12,000. Freight from Seattle is 3½c. per pound. We would have had to build an ore-bin, increase the size of the building, and buy more plates and self-feeders, all of which are expensive. This company is greatly pleased with the above results and is preparing to install four more mills—one to be placed in front of the other battery and the remaining three to be fed by gyratory crushers.

In conclusion, allow me to state that I have been for many years an advocate of the stamp-mill process, but the experimental test recently made has shattered my former conviction.

JOHN A. STEWART,
Superintendent for the Bonito Mining Company.

Barron, Wash., January 10.

The Moore and Butters Filters.

The Editor:

Sir—Referring to Mr. E. H. Nutter's article on the Moore filter, in your issue of December 15, it seems to me that a choice between the two rival filtering systems must rest upon broader grounds than those given by Mr. Nutter. Even if experience should prove that the Moore method requires somewhat less power, and that, all conditions being equal, the Moore plant is less expensive to install, this would not by any means establish the superiority of the process.

Let us consider the vital points at issue. We can only arrive at a just estimate of the Moore and the Butters-Cassel systems by comparing operating costs, and particularly the important items of repairs and maintenance; and until such a comparison is forthcoming, no conclusion is possible. A comparison of the efficiency and operating expenses at two representative plants, namely, the Butters plant at Virginia City, treating 200 tons per day with the Butters-Cassel process, and the Liberty Bell plant at Telluride, treating 350 tons per day with the Moore process, would be extremely interesting. From my experience at Goldfield and observations at Virginia City, I can safely say that the cost of maintenance of a Butters filter is a very small item. The frames are stationary and subjected to no wear beyond the action of solutions on the canvas, and there is no shifting mechanism to require repairs. I am informed that the cost of repairs of the Moore filter at the Liberty Bell mill have been very heavy, and that breakages and certain defects in the mechanism of the plant have caused serious interruption of operations. I understand that many of these defects have been partially corrected, but they nevertheless point to fundamental weaknesses in the system.

Aside from the question of comparative operating cost—in which the Butters-Cassel filter can, I believe, be shown to possess distinct advantage—something must be said for the *stationary* filter. In most of the current discussions on filtering, this feature is barely alluded to. As a matter of fact, it constitutes one of the chief points of merit in the Butters system. The importance of keeping the filter stationary is obvious enough when we consider its true function. To ensure good work—that is, a uniform deposition and a clear filtrate—the frame must be as nearly as possible straight and true, and the canvas free from weak places, ripped seams, etc. In the interval between complete deposition and the displacing operation, we have a period of suspension during which the vacuum is reduced just enough to hold the cake in loose adherence to the canvas, yet not enough to dry and crack the cake. The maintenance of the slime cake in the best condition for the displacement by water is a delicate operation, requiring careful manipulation. Obviously, to give the best results, the filter must not be stretched or strained; there must be a uniform and quiescent condition of the filtering surface throughout.

In the Moore process, as is well known, the frames are mechanically lifted from one tank to another. To accomplish this without, to a great or less degree, disturbing the integrity of the cake, and straining the frame, is practically impossible; at least it could not be done without the use of a prohibitively delicate and expensive mechanism. However carefully the thing is managed, the filter is subjected to a strain; the unity of the cake is disturbed; minute cracks are formed, and portions of the slime-cake drop off during transfer. The seams of the canvas, subjected to an alternating tension and relaxation, weaken and finally give way, producing annoying leaks and murky filtration. The result of this straining action is not only that it interferes in various ways with perfect filtration, but it means endless repairs to the frames, and annoying interruptions. In addition, we have all the troubles incident to the use of a complicated traveling-crane mechanism under heavy duty.

I am sure that a history of the few Moore installations in this country would exhibit a somewhat heart-breaking record of difficulties and discouragements. On the other hand, I can attest from personal experience, that the Butters-Cassel system has been a source of complete satisfaction wherever it has been installed. The Combination plant at Goldfield has run from the day of its installation with uninterrupted smoothness, without a single important alteration, and no repairs beyond an occasional overhauling of the centrifugal slime pump. The filters have never been taken out for repairs during a service of nearly a year, and will probably last until the canvas rots. There is no sloppiness in the operation, no unsightly, dripping slime-frames to move about. The system shows a mechanical orderliness and cleanliness, which, whatever its other merits may be, appeal strongly to both operator and observer.

In a word, though the Moore system may possess the advantage of requiring somewhat less power, the sum of advantages, in so far as we can estimate them, would seem to be on the side of the Butters-Cassel process, from whichever point of view we choose to take, whether that of the mechanic who is looking for the simplest mechanism, or of the metallurgist, who is striving for the best net result and lowest cost of operation.

F. L. BOSQUI.

Denver, January 15.

PRICE OF COPPER.—While undoubtedly 25-cent copper will interfere to a certain extent with new construction, it seems that at 20 cents capitalists are willing to go ahead with the electrification of existing railway lines, and therefore it can with confidence be predicted that nothing at present will cause the price to break below 18 or 20 cents per pound. While aluminum theoretically at its present price could supersede copper, yet the mechanical difficulty of handling it prevented its extensive use in transmission lines.—J. Parke Channing.

Mistakes in the Design of Mining and Reduction Plants.

Written for the MINING AND SCIENTIFIC PRESS
By S. A. WORCESTER.

It is believed that by calling attention to some of the mistakes that are most frequently noted, this article may prove suggestive and useful to mine operators. A wide observation among the many mining and metallurgical works erected in the Rocky Mountain States, lends support to the impression that many of them have been built without any more elaborate plans than a penciled sketch on the edge of a newspaper; some large plants have been laid out with a soft pencil on a piece of plank; others have been designed by technical men freshly graduated and untouched by experience. A large proportion of the mining and milling installations are designed by machinery firms, who impress upon their patrons the idea that this designing costs the customer nothing, but no very brilliant reasoning is required to make the interest of the machinery builder evident in the sale of his own machines, to the exclusion of all others, regardless of the customer's interests. Too many of the works thus designed free of cost, prove to have a practical value about equal to the supposed cost of the drawings. A few of the large mining corporations employ a force of draftsmen, under the direction of engineers of long experience and thorough education; where this is done, and sufficient time is allowed for designing, the results are apt to be good. Not many operators, however, employ mechanical engineers constantly.

Not long ago the operator of a small mine, with a 20-ton cyanide plant, decided to add a second set of rolls, to move his crusher closer to the mine shaft, and to raise his head-frame, so as to give height enough to chute the ore direct to the crusher, and save tramming. About this time he was approached by an experienced draftsman, who offered to make drawings of the proposed changes for a small sum. The operator saw that the draftsman's ideas were practical, but did not see any necessity for drawings. "You're all right," said he, "but I know just what I want. I don't need any drawings." He proceeded to build a frame, on which he set his crusher, and found, to his surprise, that a feeder had to be made to get the ore from the crusher to the rolls. He then raised the head-frame a distance which he was sure would be ample, and built his chute, and found that he didn't have height enough after all, and he now shovels the ore from the chute to the crusher. With cutting, trying, and making over, he and two mechanics spent more than two months getting into operation an arrangement that any good draftsman and constructor would have designed in much better shape and got into satisfactory working order within three weeks at the outside, with the same force of men. In another case, a mining company was substituting an electric motor for a mule, to propel an ore-car between shaft and ore-houses, and the arrangement was complete and ready for work, except the trolley. No drawing or sketch had been made for this part, but a machinist was told to make some kind of trolley. He did so, with the help of the blacksmith, and when the complicated arrangement was attached to the car, it literally 'fell down,' and refused to be of any use whatever. A second trolley was made with the same result, and a third one was finally made to answer, although it was made with so strong an upward pressure that it broke the trolley-wire every few days. Finally the wire was replaced by a rail of ½ by 1½ in. iron, which withstood the pressure. About a month was consumed, after the first start, in experiment and delays, before the trolley was finally successful, and it is still a poor arrangement. An experienced draftsman was within easy reach, and could have sketched the simple, cheap, and satisfactory trolley commonly used in traveling-crane work, at a trifling cost.

Cases like these, in which designs and drawings are entirely omitted, are of frequent occurrence in every mining camp. The plank and soft pencil layout, which I have mentioned, is usually made by a carpenter or millwright whose principal weakness is his inability to analyze and calculate intelligently the stresses in his framed structures. When he lays out a piece of work, he uses timbers of the same size he has used or seen used before, as nearly as he can remember, and if in doubt he simply makes them good and heavy. With all his waste of timber there are usually a number of weak points in his structures, which become evident when any unusual lode occurs. One favorite practice is the lavish use of 12 by 12 timbers and struts, generally in places where no justification, either practical or theoretical, can be found for anything larger than 8 by 8. In supporting floors, tank-bottoms, ore-bin sides, and slopes, etc., the value of relatively deep joists and timbers is not appreciated. The tables authorized by the U. S. Department of Agriculture, Division of Forestry, using a minimum safety factor of 6, are excellent authority and safe dependence on the strength of timber, and they show very clearly, for instance, that a 4 by 12 joist, with its 48 in. of section, is not as strong edgewise as a 3 by 14 joist, having but 42 in. of section, and that a 12 by 12 girder, with 144-in. section, is not as strong as an 8 by 16, having but 128 in. In the timber bill for a single large plant, the judicious use of relatively deep joists and timbers has saved several thousand dollars, and given a stronger construction than usual.

One of the most common structural weaknesses is the result of using built-up timbers, of one inch to two and one-half-inch plank, bolted or nailed together, for sustaining compression. I have in mind a roof of 60 ft. span, 600 ft. long, supported by trusses whose upper chords (or compression members) are made of two-inch plank bolted together, and the lower chords (or tension members) are of solid timbers spliced. Not much observation or experiment is necessary to demonstrate the weakness, sidewise of a built-up timber of this kind. Any long built-up timber, if laid on end supports and turned first edgewise and then sidewise, will show a deflection so much greater sidewise, by its own weight, as to convince anyone of its weakness. I have observed a number of failures, in trusses and other structures on this account. Solid timbers do not have this defect. On the other hand, built-up timbers are much better than spliced solid timbers for lower chords of trusses and for tension generally, for the reason that a well-nailed and bolted built-up timber has from 70 to 90% of the tensile strength of a solid timber of equal section, whereas it is difficult to splice a solid timber so as to give more than 30% of its tensile strength at the splice.

An item of still greater importance than construction of buildings and stationary plant, is the transmission of power and the arrangement of machinery for this purpose, and for repairs and maintenance. The plant having the 60 by 600-ft. roof mentioned, was designed by a young technical graduate immediately on leaving school and included, among other peculiarities, 15 ore-bins, each of which had a complete inclined grizzly bottom. One conveyor about 200 ft. between centres, beneath the bins, carried the screening to the rolls, while a second 200-ft. conveyor, in front of the bins, carried the coarse ore from the bin-gates to the crusher. An experienced designer sees at once, in this arrangement, 14 superfluous grizzlies and one superfluous conveyor, with their firs[t]

outlay and maintenance to be provided for. A sampling plant that I have in mind was built five years ago with floors about 18 ft. apart, where there is no possible object in having more than 12 ft. All floors are at least one-third larger than they should be for economical working. The entire plant is built in duplicate at a cost of nearly $100,000, yet so designed that its actual capacity is less than that of others of half its size. Every pound of ore has to be shoveled into wheelbarrows. The great height of the floors makes elevators lift material at least 50% higher than should be necessary. Much expensive handwork is done and the power consumption is high, yet we are told that no amount of argument will induce the manager to spend a few dollars for labor-saving improvements.

In most stamp-mills the principal power consumer is the stamp-battery, and one particular arrangement, which still appears in the design of new plants, has so many objectionable features as make the perpetuation of it a blunder. I refer to the type of transmission which includes a number of small high-speed motors, with the necessary belts, shafts, and pulleys for reducing speed, and which places the transmission on front-knee framing. The horizontal belts are seldom at their most effective tension, and as they have fixed centre distances they must be taken up by using belt-clamps, when they stretch. Three speed reductions are usual between small motors and cam-shafts; the friction load of this arrangement is high and the efficiency of the small motors is low. Where one motor runs two or three batteries friction-clutches are used, and I have observed that these clutches need frequent repairs in both wet and dry mills. The front-knee framing, besides being expensive, occupies overhead room that is often desirable for other purposes. I prefer, for nearly all cases, the simple back-knee battery-frame, leaving a clear space in front of the batteries; one cam-shaft for each 10-stamp battery; one slow-speed motor for 30 to 50 stamps, belted to a line-shaft running beneath the battery floor; cam-shafts put in motion by tightner-pulleys on the slack side of belts. This arrangement is simple and compact, its friction-loss is low, and the belts can always be given just the right tension and will run by long periods without taking up.

In favorable contrast with such ill-planned plants as have been mentioned, there is occasionally found an installation that has been designed by an experienced engineer, technically educated, and having no business connections with manufacturers or agents. Such a constructor usually demands plenty of time and a good price for his work, and if his only interests are his professional reputation and the agreed compensation, the employer is apt to be benefited by the outcome. I have in mind a plant that was erected about two years ago. The general manager sent a full description of the conditions to a large number of manufacturers, inviting each to state what forms of apparatus he would recommend for the purposes indicated, and to submit quotations for such an installation. Each manufacturer replied, advising some form of equipment for which he had patterns and drawings on hand. The manager, dissatisfied with their proposals, engaged a mechanical engineer to design a special installation. After getting necessary measurements and other data, the engineer made five or six preliminary pencil drawings, outlines of different general arrangements for the plant, each of which seemed to have some special advantages. These preliminaries were then minutely compared and their relative advantages discussed in consultation with the manager and superintendent, and the one was selected that possessed the largest number of good points. This arrangement was then carefully modified so as to gain as many as possible of the merits of the other plans. Detailed drawings and tracings of the machinery and construction were then made, every needed dimension being shown and the number of pieces and material for every part being indicated on the drawings. These were then accurately checked in every dimension, letter and figure, by another draftsman. All calculations made in the process of designing were also carefully checked in every dimension, and after any errors had been rectified, six full sets of blue prints were submitted to manufacturers for bids. Full specifications were also written, itemizing material and workmanship in detail, including complete erection and testing of machinery by builders before shipment, etc. The highest tender received for this proposition was found to be lower than any of those made for the plants suggested by machinery concerns. The highest bid made for the drawings was 50% greater than the lowest and this difference was sufficient to pay the engineer's fee several times over. While nicely adapted to the local conditions in every detail, and making use of every up-to-date device for saving labor that could be applied to advantage, this specially designed plant made an actual saving of more than 50% in power over the best of the designs first offered. While this is probably an exceptional case, it suggests forcibly the value and importance of the work of a competent and unbiased expert. As a rule far too little time and expense are allowed for design and preliminary work, by operators of moderate sized mining and metallurgical plants, before beginning construction. They fail too often to realize the immense difference between the cost and time involved in construction and experiment on paper and the same operations in actual materials. The designs for an installation of any magnitude should not be approved until they have been thoroughly discussed by the manager or superintendent, with his responsible assistants, and all of their suggestions given due weight.

WATT-METER DIALS.—In reading these the beginning should be made with that having the lowest capacity, writing the result from right to left. In this way error due to reading pointers near the zero mark will be eliminated. Often it is common practice to read from left to right, which entails the necessity of looking at the next figure to the right before recording a digit, making an awkward proceeding, with a liability of error. Practically all meters in general use today are watt-hour meters, the dials registering the use of electrical energy in watt hours, which term is electrically defined as a current of one ampere flowing under the pressure of one volt for one hour. An electrical meter is an electrical motor, the speed of which depends on the amount of energy flowing through same, and should not register when current devices are not in use. They do register, however, when over-compensated or too finely adjusted to overcome the friction of the bearing, which condition is called 'creeping'—often due to the change in strength of the two permanent magnets placed in the meter to have a retarding effect on the speed of the disc.

ORDINARY business precautions are unfortunately often put aside when one comes to deal with mines. An otherwise smart business man, who drives a hard bargain in his own particular line, will frequently be found to part readily with money on the representations of a comparative stranger, without taking the ordinary precautions of making personal inquiries or getting the advice of a suitable man, should he lack time to investigate or knowledge of mining to enable him to himself form a correct opinion.

Dredging and Horticulture.

Written for the MINING AND SCIENTIFIC PRESS
By D'ARCY WEATHERBE.

Much has been said and written since dredging commenced in earnest in the Sacramento valley on the question of the destruction of the land by rendering it unfit for future agricultural purposes, chiefly fruit culture. A large portion of this matter, particularly that which has appeared in certain popular magazines, is, to say the least, misleading. Efforts have actually been made to restrain companies from carrying on their operations. No apology, therefore, is needed in referring to this subject. Care has been taken to obtain the facts from persons interested both in dredging and in the culture of fruit, and the following brief remarks sum up the results of such investigation.

Oroville is the most important district in this connection and here the possible dredging lands, including what have already been worked, will probably cover about 6,000 acres. Of this tract less than 400 acres has been planted in fruit and though about 1,000 acres of the remaining portion, at an outside estimate, might with irrigation be used, it is ground of a poorer quality, requiring much annual expense in water and cultivation, and it is extremely doubtful, judging by the prevailing conditions, whether it would ever be used for this purpose. Of the 400 acres mentioned, 150 acres are included in the Leggett vinery, which for several years has been infested with the practically fatal phylloxera and probably $300 per acre would cover the amount on which it would pay, say, six per cent per annum, for horticultural purposes. Similarly, the Wilcox peach orchard, covering 50 acres, produced an average of one crop in three years, and might provide an income of six per cent on $100 per acre. The Gray peach orchard of 20 acres would pay a fair rate of interest on $200 an acre. The Gardella tract is a fine piece of land of 40 acres and peculiarly adaptable for the production of vegetables as well as fruit, and for market gardening generally, and would possibly pay six per cent on $1,000 per acre. The remaining portion cannot be valued at over $50 per acre, and the whole 6,000 acres would not represent at the outside an invested capital of over $250,000. Moreover, it is a well-known fact that most of the ranches in this district were mortgaged.

If we say that the district will yield on the average 10c. per yard net profit and averages eight yards in depth, both fairly conservative estimates, then over 23 million dollars net profit will be produced and if invested in the State at six per cent, will produce an annual income of over $1,380,000 instead of the paltry revenue of $15,000 per year, which the land produced before. Besides this, for a long period a large population will be employed in the district and at the end of the period of operation another 20 million dollars should have been expended in labor and machinery.

On the Yuba the question of interference with arable land does not arise.

At Folsom most of the bench land has been worked over before by gravel miners, who left a large proportion of it in such a condition that it is unfit for cultivation. Of the 6,000 acres available for dredging, probably not over 5% has been planted and little more is available for planting, the chief product being grapes. This land is owned by the Natoma Vineyard & Winery Co., and the population it actually supports is small. A comparison similar to that at Oroville might be made in regard to this district, which would probably show even less favorable results for those busybodies and other uninterested parties who have attempted by unwarranted agitation to raise a storm in a tea cup. If the question be really pushed to an issue, an excellent solution would be to invest enough of the proceeds of the dredging operations in the filling of the now worthless tule lands (of vast extent in this valley), so that an acreage equal to that destroyed might be put into cultivation. This, however, would probably be an inconsiderable sum, particularly as the sale of such land would, of course, revert to the dredging companies.

After dredging, the land is covered with stack piles, containing boulders and pebbles, the fine material being hidden 6 to 15 ft. below. In regard to the reclamation of land in this condition, certain experiments attempted by Mr. J. H. Leggett, at Oroville, produced interesting results. Eucalyptus of both the 'blue' and 'red gum' variety and some fig trees were planted on the stack piles, and alfalfa grass is also growing. The trees, when set out, were only about 10 in. high. In the case of the largest tree, 19 ft. of growth was attained and of course this will increase in greater proportion with time. Some of these trees were planted directly on top of the highest ridges, 15 ft. above the original surface, and Mr. Leggett states that one cannot dig a hole at any of these highest points more than two feet without getting moisture, even in the driest time in summer. The volcanic ash that forms the bottom of the digging and the material of certain clay bands is often carried over the stacker in lumps and disintegrates on being exposed to the air so as to form the soil necessary to growth. The alfalfa roots were accidentally thrown up by the dredge and the grass seems to do particularly well. Absolutely no care was given to the trees or grass from the time they were set out.

Nevertheless, it is not considered with the stack piles in their present condition of irregular surface that a profitable horticultural industry could be built up. It has been suggested that the piles might be leveled with huge scraping rakes run by electric power, and in this connection an instance of the present cost by hand for leveling at Oroville is given. Near the town the original owner of a tract that was dredged agreed to put the ground in a suitable state of cultivation if given to him. He leveled one acre and covered it with one foot of soil and now has a productive garden; the total cost of levelling and covering being $250.

Ground that was dug by the single-lift dredges (with the long sluice on a pontoon to the rear) was left in as good condition as before dredging commenced, that is, for agricultural purposes. It is perfectly flat and the fine tailing is mixed with the pebbles and boulders, and in many cases is altogether on top. Instances of this may be seen where the Continental dredge operated at Oroville, and at Folsom a particularly good example is afforded by the work of the *Ashburton*. This boat originally employed a long-sluice method, but changed to the ordinary screen and tables, and the contrast between the two results in stacking may be observed on the same property, the work having been done by the same dredge.

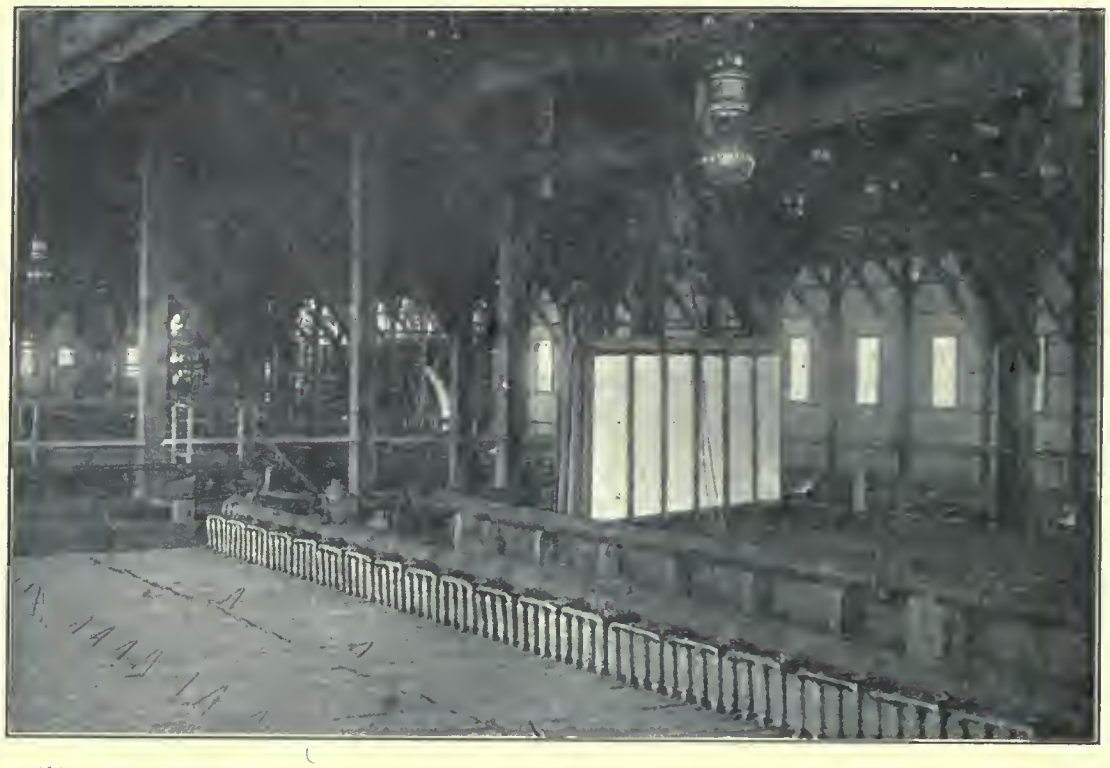
At Folsom the stack piles are to become a valuable asset in the hands of the enterprising management of the Folsom Development Co., who are installing a rock-crusher plant and the product is to be used in railway and road ballast, and for concrete work.

IN drilling with machines it does not pay to overload an air-compressor with too many drills, or to use a main pipe so small as to reduce the air pressure materially. Experiments show that a drop of pressure from 75 to 45 pounds will reduce the length of hole drilled by more than 50 per cent. Great care should be taken to have no leaks in the pipe-line, especially in the hose and couplings.

The Butters Filter.

Written for the MINING AND SCIENTIFIC PRESS
By MARK R. LAMB.

The accompanying illustration shows a Butters' filter with the necessary tanks and pumps. The filter is extremely simple and consists merely of two sheets of canvas sewn to a core of cocoa-matting. These resulting leaves or cells are supported by a wooden strip at the top and by a frame of half-inch pipe at the sides and bottom. The cells are connected by short nipples and hose to the vacuum-drum. When the filter-box is filled with pulp, which has been previously agitated with solution, the vacuum draws the solution from the slime, leaving the latter on the leaves in the form of a layer. This layer is made from 0.75 to 1.5 in. thick, depending on the class of slime. During the time the slime-cake is being formed the filter-box is kept full of pulp, the additions replacing the solution withdrawn through the cells and keeping the slime agitated.



The Butters Filter at Work.

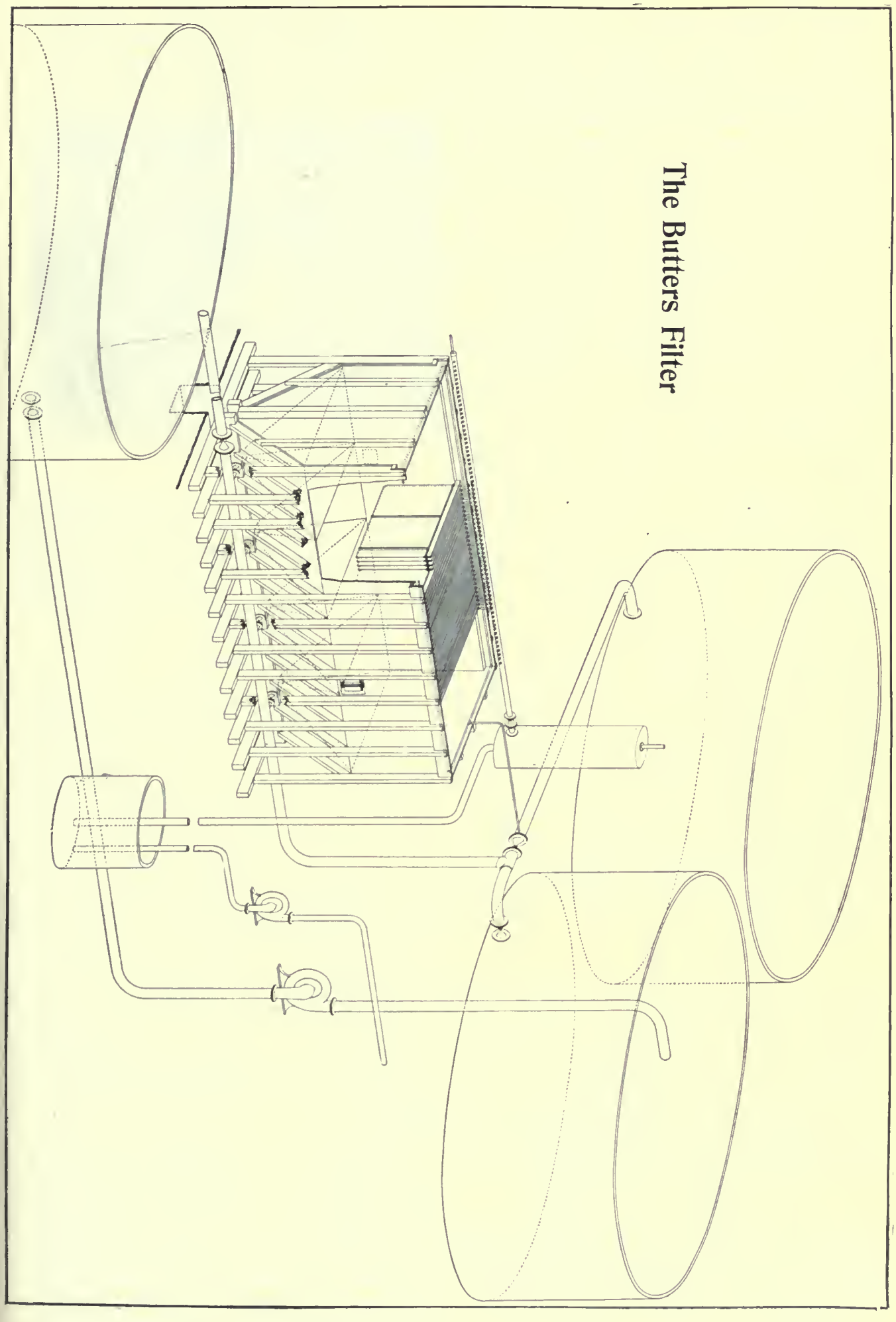
The layer forms continuously and, as would be expected from the nature of the operation, its thickness varies from top to bottom, depending upon the permeability of the stuff deposited. In other words, the slime resulting from all-sliming, which contains fine sand, forms a thicker layer on the lower portion of the leaf than on the upper. This thicker part is more permeable and is washed in exactly the same time as the thinner but denser upper part.

After the layer of slime has attained the desired thickness, the pulp remaining in the box is drawn off to the pulp-sump, and the box is filled with water. This water is drawn through the slime until the latter is thoroughly freed from solution and metal in solution. The vacuum is then broken and clear water introduced under slight pressure into the interior of the leaves. This dislodges the slime which is discharged from the hopper bottom through a gate-valve. Where it is desirable, a large portion of the water remaining in the box can be withdrawn before the slime is discharged, and if water is very expensive the slime can be dislodged with compressed air and trammed from the filter-box. The small centrifugal pump returns the pregnant solution to zinc or fume or electrolytic precipitation boxes. The large centrifugal pump returns the excess of unfiltered slime to its storage vat. All valve-stems are extended to the operating floor, which permits one man to treat almost any tonnage. The canvas does not seem to deteriorate, one set having been in service over two years. The lime used in neutralizing acidity appears to protect the fibre. When this calcium carbonate accumulates sufficiently to delay operations, it is removed by subjecting the leaves to a bath of 2% HCl.

The filter-box may be made either of wood or iron, as may seem advisable, depending on the locality, costs, and freight. Where the site does not permit of filling and emptying the box by gravity, the pulp is circulated and transferred by the pump. The valves in such a system are all placed near the pump and controlled from the operating platform above mentioned. The wash attained by the filter is notably perfect and is accomplished by the use of a minimum of water.

Slime is now being treated, resulting from the milling of Tonopah ores, which it would not be possible to treat by decantation, and for which a filter-press installation would be prohibitively expensive, as well in first cost as in labor and power. This filter combines the best features of the Moore, Butters, and Cassel patents and will be the means of extracting precious metal from slime not amenable to treatment by any other method, as well as from sand now treated by percolation, but which will be ground much finer and treated by agitation and filtration.

MEN are often heard to speak of the money they have made or lost in mining. On making closer inquiries we generally find that the losses or gains were not made in mining, but in speculation, the profits frequently coming out of other men's pockets instead of out of the ground; while the losses are often considered as the difference between the highest quotation during the time the operator held them, and at which they might have been sold, and the price at which they were eventually parted with.



The Butters Filter

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Where the validity of the location of a mine had been unchallenged for more than five years and up to the beginning of an action in ejectment, and where it appeared that the original locators were absent from the country the court decided that the certificate of location created a presumption of discovery of mineral and of a valid location. The court said that especially should such a presumption be indulged in a summary proceeding instituted at the beginning of a suit where the granting or withholding of an injunction depended upon facts presented by affidavits and which rested largely in the discretion of the trial court, and where a subsequent locator attacked the title of the prior locator, or that of his successors in interest. The trial court committed no error in denying the injunction applied for, on the ground that the location notice failed to mention the discovery of gold on the claim, and that such conclusion was aided by the affidavit of the complainant, who had a lay on the claim and who stated in his affidavits that pan had been discovered by him and his co-lessees and that "gravel on said claim is exposed on the surface on many parts thereof and carries fine gold throughout, so that panning from the surface is easily done and colors are easily found."

In the same case it was decided that a location notice was sufficient which described the claim by metes and bounds and a reference to stakes set in the ground, and added that the claim "lies about one miles from Anville mountain, in a southeasterly direction." The defect of the notice was claimed to be that it pointed out no particular portion of Anville mountain as a beginning point. While the court was not advised of the shape or dimensions of the mountain it stated that in the absence of evidence to the contrary, it would assume that it was a recognized landmark.

Vogel *v.* Warsing, 146 Fed. 949.

A part owner of a placer mining claim brought an action to recover possession of the interest of his co-owner, claiming a forfeiture for failure to pay the amount of assessment work done on the claim. The issues presented for trial were whether assessment work of the value of $100 had been done, and whether the requisite notice of contribution had been served as required by statute. The law required $100 worth of work. The Court refused to order a forfeiture, where it appeared that such part owner simply went on the claim and did thereon what he considered $100 worth of work; it was not sufficient to entitle him to maintain his action that he made a bona fide attempt to comply with the law in order to obtain a forfeiture of his co-owner's interest had no part in the questions to be considered by the jury in aid of the proof that he did or did not do the requisite assessment work.

McKay *v.* Neussler, 148 Fed. 86.

The statute of Iowa provides that every laborer or miner who shall perform labor in opening, developing, or operating any coal mine, shall have a lien on all the property of the person, firm, or corporation owning or operating such mine, and used in the construction or operation thereof, including real estate, and personal property, for the value of such labor, to be secured and enforced as mechanics' liens are. It was held that this statute did not give a lien on the mining property of the owner in favor of the employees of a person operating the mine as a lessee, as the word 'or' between the word 'owning' and the word 'operating,' as used in the statute, could not be construed to mean 'and.'

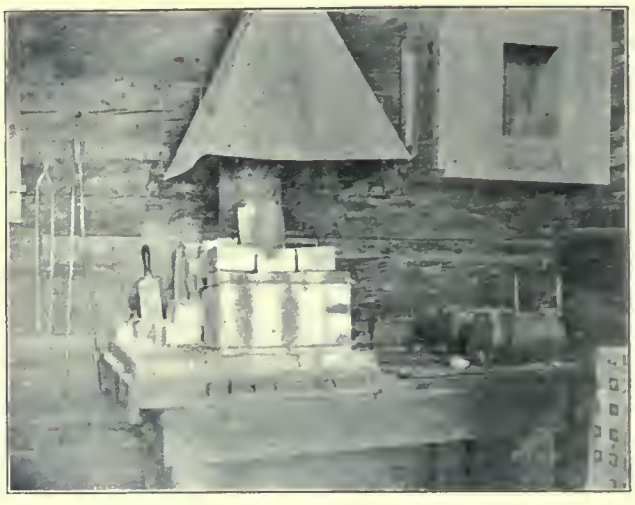
Caster *v.* McClellan (Iowa), 109 N. W. 1,020.

A person who performs services which consisted in caring for mining property in the way of paying taxes thereon, listing it, and keeping off trespassers, was held not to be entitled to a lien which followed the property in the hands of the purchaser.

Morrison *v.* New Haven &c. Min. Co., (N. Car.) 55 S. E. 611.

A Simple Assay-Furnace.

The illustration shows an extemporized crucible furnace erected at Cornucopia, Oregon, in 1897. Heavy snowstorms completely shut off the camp from communication with the railroad, and supplies ordered were held at the roadroad for weeks. The construction is simple, as illustrated. Eight ordinary fire-bricks were placed on end, surrounding one brick that served for a floor. Fire-clay was used as a cementing material, and the furnace clamped together by ⅜-in. iron rods, with an eye on one end and threaded for a nut on the other, such as could be made in any mine blacksmith-shop. Three fire-bricks were used as a cover. A hole was chiseled out for the admission of a gasoline burner.



A Simple Assay-Furnace.

Roof Support.

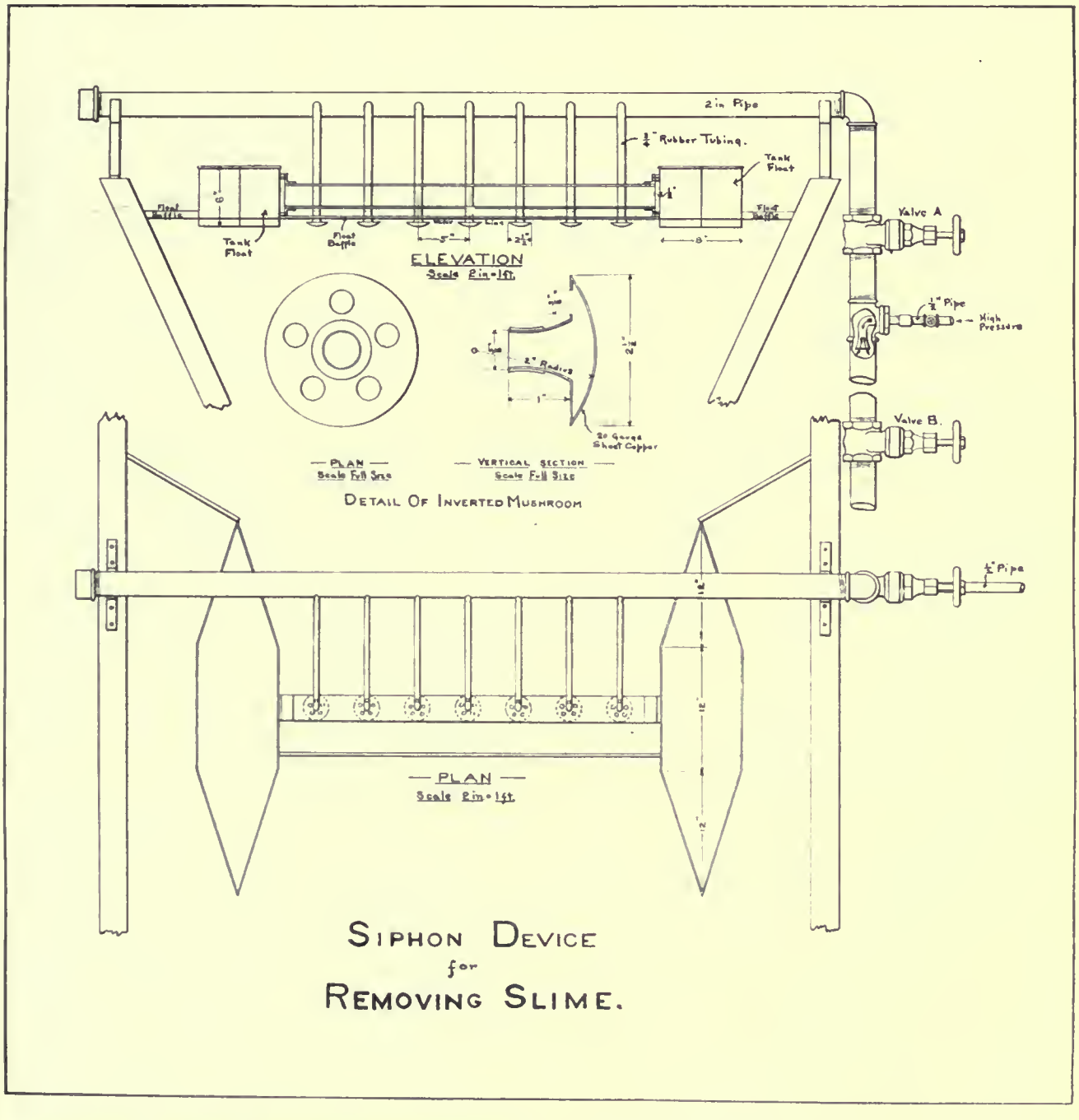
An economic method of supporting the roof in main haulage-ways is practiced in French collieries. Old iron rails are bent slightly and placed transversely across the drift so as to form a low arch. The ends of these are supported on dry-stone walls built up at the side of the drift, sill-plates being laid to distribute the weight. These rails are arranged at intervals of about one to three feet, according to the character of the roof. Across these a number of rods, having their ends turned down, are placed longitudinally to form the lagging. Iron bars, one inch square, may be used for this, but in practice a great deal of scrap iron can be made up by a blacksmith into suitable material. In this system nothing is fixed until the roof settles down, and all parts are interchangeable so that, in the case of a cave, repairs can be completed very quickly and all material used again. Where the system is feasible and good roads are required, the cost will be found very low, as most of the material can be gathered up round any large mine or bought cheaply. A heavy roof can be readily detected by the bending of the lagging rods, a fact which gives this method a great advantage over that of the systematic use of iron girders.

SECOND-HAND MACHINERY is seldom the bargain some purchasers suppose; it has often been discarded by more advanced mines; it can seldom be given a run before purchase, and not being new has no makers' guarantee. Frequently the machine is in some out-of-the-way place, so that it costs more to dismantle, pack, and transport it to a new site than it is worth; small parts get lost and broken, and it generally costs more to erect than a new machine. The purchase of second-hand boilers is almost always false economy, unless one knows they have been properly treated and looked after.

A Siphon Device for Removing Floating Material.

Written for the MINING AND SCIENTIFIC PRESS
By EDWARD S. WIARD.

The device described and illustrated in this article was used by the writer in a mill in northern Idaho to remove particles of floating galena from the surface of the water in a long V-shaped tank, distributing thickened pulp to a number of Wilfley tables and vanners. Owing to the manner of mining, the milling ore contained an extraordinary amount of wood, causing more than the usual trouble of stopping up plugs and clogging the riffles of the Wilfley tables. An examination of the floating material showed it to consist largely of fine bits of wood to which had adhered scaly pieces of galena; the adhesion of the two being possibly assisted by a film of grease on the wood. The galena was rather richer in silver than the regular run of concentrate; tests with silver-leaching salts and an examination with the microscope showing the increase over the normal proportion to be due to tetrahedrite. This mineral was in minor amount in the ore as it came to the mill, the predominant silver mineral being argentite. A little galena was lost by greasy flotation. The undressed ore contained large amounts of spathic iron and the tank-water was slightly acid. Apparently, the top layers of the water in the tank were perfectly clear but the insertion of a baffle-board would cause a black scum to dam up behind it, constantly being augmented, and spreading over the surface of the water. The galena could readily be separated from the wood by agitation; after shaking a portion of water and scum in a beaker, the wood would rise to the top and the galena settle to the bottom.



SIPHON DEVICE
for
REMOVING SLIME.

The water from the siphon was used to wash down the concentrate formed by the vanners. Clean water was scarce and, it being necessary to make a concentrate high in lead, it was not possible to use the overflow water of the tank for sluicing purposes. The overflow of the tank contained a noteworthy quantity of fine matter, which was further settled on the lower floor.

The device, herewith illustrated, is suggestive of a means of reducing the volume of water flowing through a tank. The slime and sand treated in the mill under discussion were rather free from clayey matter and the surface water but a few feet from the feed end of the tank was very nearly clear. The device floated in the water about two-thirds the way from the feed end to the over-

flow end, but it would have been possible to have placed it much closer to the feed end of the tank and obtain water free from low-grade slime. For the purpose of merely removing comparatively clean water, a number of the devices could have been used.

The two float-tanks should properly be made of thin sheet aluminum. My floats were made of No. 30 sheet iron heavily coated with bitumen. At the top the sides are bent over a heavy wire, bent to the shape of the tank, to give stiffness. The rubber tubing used was ¾ in. outside diameter, with walls 3/32 in. thick. The tubing should be thin-walled, so as not to interfere with the free vertical movements of the floats. The bracket between the floats, supporting the tank-end of the tubes and the inverted mushrooms, is made of light strips of wood stiffened by four little angle-irons in the corners. These can be quickly made and bored and countersunk for wood screws by the mill-blacksmith. Care should be taken to make the upper row of holes in the bracket vertically above the corresponding lower ones. These holes should be of a little less diameter than the tubing; the tubing will then be firmly held and yet adjustable. The inverted mushrooms or strainers are made of No. 24 copper plate. With the form of strainer used, the pull due to the siphon action drew the top layer of water downward and in from the sides firmly and gently. With a simple tube in the water a current would be created from the bottom of the tank that would stir up the low-grade slime below the upper layers of water. The nipples on the 1½-in. pipe are short pieces of pipe screwed into the sides. The tanks are prevented from moving from their positions by strings fastened from their points to the nipple pipe; they are not shown in the drawing. The little strips of wood from the points of the floats to the sides of the tank are in the nature of baffles to cause the floating material to converge toward the mushrooms and prevent its passage between the floats and the sides of the tank. A similar strip floats behind the mushrooms to prevent floating material from passing by them.

The siphon device is started by opening the valve from the high-pressure supply; after it is started, the valve is closed and regulation is effected by the valve *A*. To avoid a climb to the tank, a second valve (*B*) was placed on the vanner floor for starting or stopping the siphon.

PLATINUM was first found in the present Republic of Colombia (then a part of the Spanish boundless domains), about the year 1735. "Not knowing its utility, it was thrown into the sea, so that it should not be used to adulterate silver." It was named *platina* (little or inferior silver). Besides having it thrown away into the sea, the Spanish Government enacted a law forbidding it to be exported in any form from tropical America to Europe, as its weight had already been seized upon by some false-moneyers (coiners) in Barcelona and Madrid, to put spurious 'gold' coin in circulation. While silver and copper, if used in base gold coin, would betray themselves by their weight alone, an alloy of platinum and copper, covered with a thin coating of gold, would not only deceive the eye, but also the most sensitive touch.

IN a cooling layer of fused rock, the smallest number of fractures that can be opened about a point on its surface by equable contraction is three, and hence this number is easiest to make; and since three such lines symmetrically placed make angles with one another of 120°, the hexogonal prism, more or less regular, is the most common form of the resulting column. This columnar structure is most common in basaltic rocks, but has also been observed in phonolyte obsidian, and other volcanic rocks.

Spanish-American Mining Terms.

Written for the MINING AND SCIENTIFIC PRESS
By H. E. WEST.

One reads nowadays in the current mining press of terms familiar enough to those conversant with the Spanish-Americas, but still foreign to many readers, and it may not be amiss to mention a few of the more common words and phrases.

Many such words have been borrowed and are in daily use in mining communities the world over; as, for instance, who does not know of *bonanza*, *patio*, *arrastre*, and the like.

In Central America the native is called a *mozo*. In some republics he is compelled by law to work. The services of a native are said to be 'compromised', or he is *compromiso* when he owes any sum of money that he may have borrowed from an obliging *finca*, or coffee ranch, and he is compelled to pay such a debt by service, not being enabled to liquidate, unless with the consent of the creditor, which is very rare, as labor is scarce and illy paid. Once in debt the *mozos* remain in debt, and they often leave the mines earning a good wage for a mere pittance. This seems an iniquitous system.

Each miner is given a *boleta*, or ticket, numbered, which must be shown at the *liquidacion* of the *cuenta* or account, every *quincena* or fortnight. The miner is called a *barretero*, that is, one who works with a *barreta* or bar. *Minero* applies to a mine owner, or to a foreman, the workmen being known as *operarios*. In Mexico we have the *peones* or serfs, poor Indians who know little else but work and often cannot understand the Spanish language. The *barretero*, of conrse, is above this class, as some centuries of mining have raised a fairly efficient, if a somewhat rough, class of men.

A *gambuchino* is a prospector. A mine is said to be worked *en partido* when the miners retain a part of the ore won in lieu of payment, and is identically the same as the Cornish 'tribute' or 'leasing'; a certain proportion of miners the world over always work on this system, and often make very substantial returns. It calls for a certain kind of ability that takes time to acquire and such men deserve all they ever get.

In Mexico, under the old laws derived from Spain, mines were held in *barras*, or one twenty-fourth part. One *barra*, often held by some of the old mining families, in a rich mine, would constitute a veritable fortune. The shares were of two classes, *aviadoras* and *ariadas*. An *aviador* is one who subscribes working capital for a mine—assessable shares, in other words; *ariada* shares, on the other hand, were free shares, subscribing nothing but participating in the profits—that is, non-assessable shares. The modern terms are *liberadas y pagadoras*—free and payable. There is a distinction in respect to the division of the profits between these old and new terms. The addition of *y Anexas* implies the mine named and its subsidiaries—for instance, in Pachuca, you will see quoted 'San Rafael y Anexas', which includes San Rafael, Sorpresa, and Soledad, and the share carries a partial dividend from each, while 'San Rafael, Aviado', pertains to that one mine and carries the full dividend declared; and the same applies to the subsidiary companies, all worked as one company, but with their ores credited to each mine, and the profit or loss arrived at separately.

The claims being pegged to all parts of the compass, more often than not there is a fraction between, called a *demasia*. This *demasia* is equally divided between the contiguous claims by a vertical projection of the dividing line.

'Denouncing' a claim is a term used for the application of properties originally taken under the old laws

and almost all property has been denounced at one time or the other, and abandoned time and time again. *Antiguas* applies to the old mines, the workings of which testify to the work done in bygone days. These *antiguas* are scattered from Texas to Panama, and a great number are being opened up at the present day.

In Central America ore is universally known as *brosa*, and waste as *tierra* or *atierres*, similar to the Cornish 'attle' or 'addle'. In Mexico ore is *metal* and waste *tepetate*. In Central America this term was used for a 'hard-pan' at surface, very similar to the *caliche* of South America. *Terreno* is the dump. A vein is *veta*. *Veta ramal* is a branch vein; smaller veins or droppers are *hilos perdidos*—lost threads. *Veta recestada* is an inclined vein. *Rumbo* is its strike. An adit or level in Central America is *taladro*, literally a drill; or, at times, *tunel*. *Socavon* is universal in Mexico. *Socavon crucero* is a cross-cut, the latter alone being adequate in Central America. *Respaldo* applies to the walls, *alto* or *arriba* and *bajo* serving for the hanging and foot-wall respectively.

Caballo is the equivalent of a 'horse', sometimes *puertas*. *Pozo* is a shaft, while in Mexico *tiro* is used; and a *tiro* applies to a shot in the former country. *Chimenea* is a raise. *Comida* is a stope—eaten-out ground after the idea of the Cornish 'gunnies'. A stope is a stope in reality when in the act of stoping—hence the Cornish distinction, which appears correct.

Bolsa is a small pocket of ore. *Bonanza* is a shoot of ore. *Borrasca* is barren ground. *Escalera* applies to the 'chicken-ladders,' or the notched poles, found wherever the Spanish language is spoken, and sometimes where it is not. *Tanates* are the bags on which the *tanatero* packs out the ores by the *escalera*, and the writer has seen this peon-packing in modern times both underground and at surface, with modern equipment lying idle—claiming an economy. *Peones* are certainly wonderful packers, and you may depend, if humanely possible, and sometimes when it is not, that a *peon* will get his job on his back—irrespective of any physical properties it may possess.

Carga is a mule-load and *cargadores* are the muleteers. *Malacate*, properly a 'horse-whim', is applied to all hoists. *Malacate* is applied to a rope in Nicaragua. *Bodega* is a store.

It is remarkable with what little knowledge of the language one can carry on work in Spanish countries. I am reminded of one good old fellow who once worked for me in Nicaragua. He was very deaf and well up in years. One day he remarked to me: "Somehow or other I can't catch on to this 'ere lingo." However, he progressed, and one day I heard him sing out "Hi, Jose, go to the *dago* and fetch me *macarthy*." These were about the only two words he ever really mastered. They refer to the two terms last quoted, in case there should be any doubt. He got his rope just the same.

Just how *santiago* should designate a 'Jim-Crow', or why the latter is considered fitting to such a useful article as a rail-bender, is beyond my ken.

Those living in New Mexico, Texas, or the Border, do not need reminding that *aparejos* and *alforjas* apply to a pack-saddle and saddlebags.

In milling parlance treating an ore is 'beneficiating'—*beneficio* meaning to treat an ore to extract its metallic contents. *Haciendas de beneficio* are treatment plants. *Patio* is the court paved with close-fitting blocks in which the patient mules tread the silver ores in the classic metallurgical process that is now passing rapidly away.

Since the fifteenth century, when Bartolomé de Medina in Pachuca, discovered amalgamation, practically all the vast silver production of Mexico has been won by the *patio*, and I remember only in 1903, at Guanajuato, seeing many large *haciendas* in vigorous work. Today the *mazos* displaces the *rastron*, or Chilean mill, and the *arrastre*, and have driven the mules, I was going to say, from, rather to, the field. It looks possible that soon no more will the *magistral*, or roasted copper ore, be incorporated in the *torta*, or pile; nor the patient *ensayador* make his *tentadura*, or horn-spoon assay, and the *planchas* will be won by cyanidation, or the modern amalgamation plant.

Petanque is applied to tetrahedrite, and *rosiclara* to ruby silver; *negrillo* to the black silver sulphide; while gossans or oxidized ores are *coloradas* and sulphides, *negras*.

What's in a name? we often hear. Much, both on the stock exchange and to the Mexican holder. These are not by any means akin in sentiment, for the former wants something that will 'catch on', as 'Sallies', 'Kangaroos', etc., while such names as 'Santa Maria de la Paz', 'Espiritu Santo', 'San Felipe de Jesus' imply a dedication and a prayer for the success of the venture to the particular saint. For religion enters strongly into the everyday life of the Mexican miner, and even today, in Mexico, altars and shrines are all but universal in the mine. Religion is woven into the warp and woof of the Indian life. The Catholic churches in Central America have embodied into all their important festivals the propensity for pyrotechnic display so loved of the Indians, so that in the early morning, and throughout the day, the city appears besieged by the number of day-rockets that are mingled with the celebration.

When a miner made a strike he usually celebrated by building a church, as the Borda church at Tlalpajahua, or gardens, as at Cuernavaca; or even solid silver altar-rails, as at Guadalupe. Alvarado, of Parral, a worthy man, but a very maligned one, built a palace.

It is not unusual for priests to officiate in the blessing of some new piece of machinery. I remember, not so many years ago, reading of the blessing of the large pump at the Difficultad shaft of the Real del Monte Co., and who shall say that either the mine or the *peon* is the worse either for a title that is full of expression to him or for a rite that through centuries of training has become as natural as the blessing of his daily bread.

Mining to the Spaniard is not merely a business proposition necessitating maximum rush and profits. A good mine is a charge to be carefully nurtured and handed to posterity. The spirit of modern mining—the maximum profits consistent with the shortest life—is an abomination to his soul and altogether foreign to his temperament.

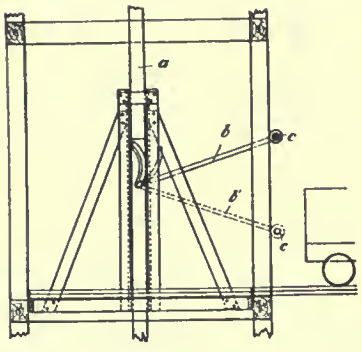
Sometimes one cannot but feel regret that all this is passing; the mines are falling day by day into the hands of the 'gringos'. Let them all go; yet many of the Spanish terms, indelibly carved on the annals of an illustrious past by a great mining nation, will outlive its mines and people.

THE kaolin, or china-clay of Cornwall and Devon, exists in irregular deposits consisting of granite decomposed in place, not by atmospheric agencies, as is often stated, but far more probably by hydrofluoric acid brought up by deep-seated fissures. That the decomposition was due to the veins or fissures seems evident from the fact that the altered rock occurs in bands adjacent and parallel to them. Where the veins are numerous a large mass of china-clay may be found, extending for a width of a hundred or more yards. The depth to which the alteration of the granite continues is quite unknown. The veins are often tin-bearing, and workings for tin have led to the discovery of china-clay; indeed, the two minerals are often worked together.

MINING AND METALLURGICAL PATENTS.

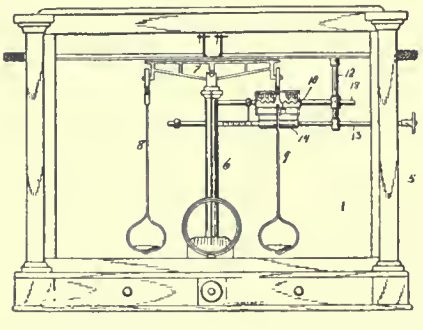
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MINE-SHAFT.—No. 841,416; Josef Mika, Bottrop, Germany.



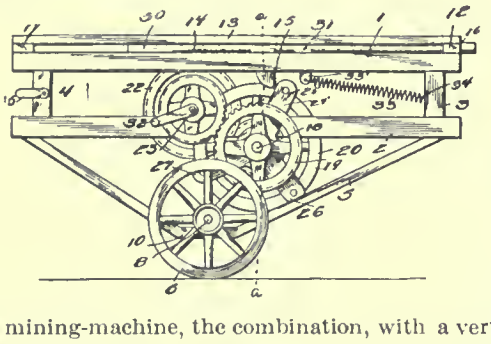
In a mine-shaft, means for closing the opening of the shaft, comprising, in combination, a rod c destined to close the shaft-opening, and two rods, b, b' pivotally mounted in the two track-ledges of the shaft and connected at their front ends by said rod c and provided at their rear ends with projections adapted to project, when the shaft-opening is held closed, beyond the track-ledges and to be pushed aside, when the shaft-opening is being opened, into slots provided in said track-ledges of the shaft, and thus to be lifted together with said rod c for opening the entrance to the shaft, substantially as described and shown.

ASSAY-BALANCE.—No. 841,477; Robert G. Ainsworth, Denver, Colorado.



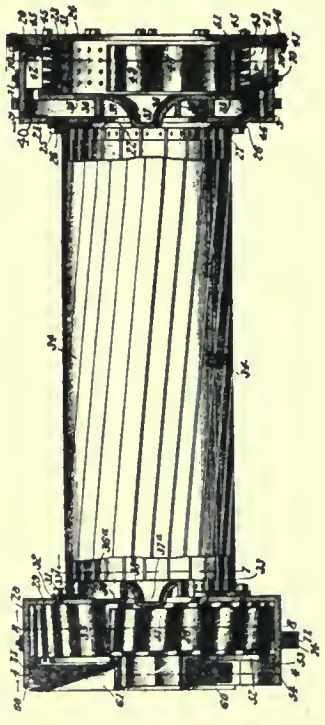
In a balance of the class described, the combination with a balance-beam, of a hanger connected therewith and provided with a horizontal part adapted to hold weight-riders, a rider-carrying lever mounted in suitable proximity to said horizontal part, and means for manipulating said lever comprising a revoluble rod carrying fingers projecting on opposite sides of one arm of the lever whereby the latter may be moved in opposite directions by the manipulation of the rod.

MINING-MACHINE—No. 841,625; William B. Chapman, Wilburton, Indian Territory.



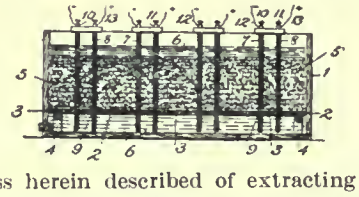
In a mining-machine, the combination, with a vertically-tiltable frame, of a strip secured to the upper face of the frame in spaced parallel relation therewith; an endwise-movable plunger mounted in the space between said strip and frame; a retractile spring connected at opposite ends to said plunger and frame; means adapted to engage the plunger at successive intervals to force the same rearwardly within said space, against the action, of said spring; and means for operating said forcing means.

APPARATUS FOR CRUSHING, CONVEYING, AND COOLING ROCKS, ORES, &c.—No. 840,730; Robert F. Wentz, Siegfried, Pennsylvania.



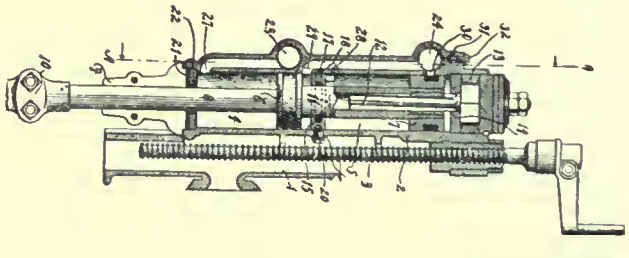
In an apparatus adapted for the crushing of rock, the combination of a rotary cylinder having perforated heads for the feed and discharge of the material, a crushing-cylinder supported within the said revolving cylinder, of a length less than the revolving cylinder and having a perforated periphery, a diaphragm closing the rear end of the chamber formed by the crushing-cylinder, feeding-flanges arranged between the crushing-cylinder and the outer shell of the revolving cylinder, means for directing the crushed material through the opening in the rear head of the revolving cylinder and means for advancing the material through the cylinder.

EXTRACTING METALS FROM SULPHIDE ORES.—No. 840,511; Robert L. Packard, Washington, D. C.



The process herein described of extracting metals from sulphide ores, which consists in converting the sulphides into sulphate by subjecting a body of unroasted pulverized sulphide ore, freely distributed throughout a suitable acidified solution, to the action of chlorin saturating said solution and recovering the metals from said solution.

ROCK-DRILL.—No. 841,139; Arthur H. Gibson, Easton, Pa., assignor to the Ingersoll-Sergeant Drill Company, New York, N. Y., a Corporation of West Virginia.

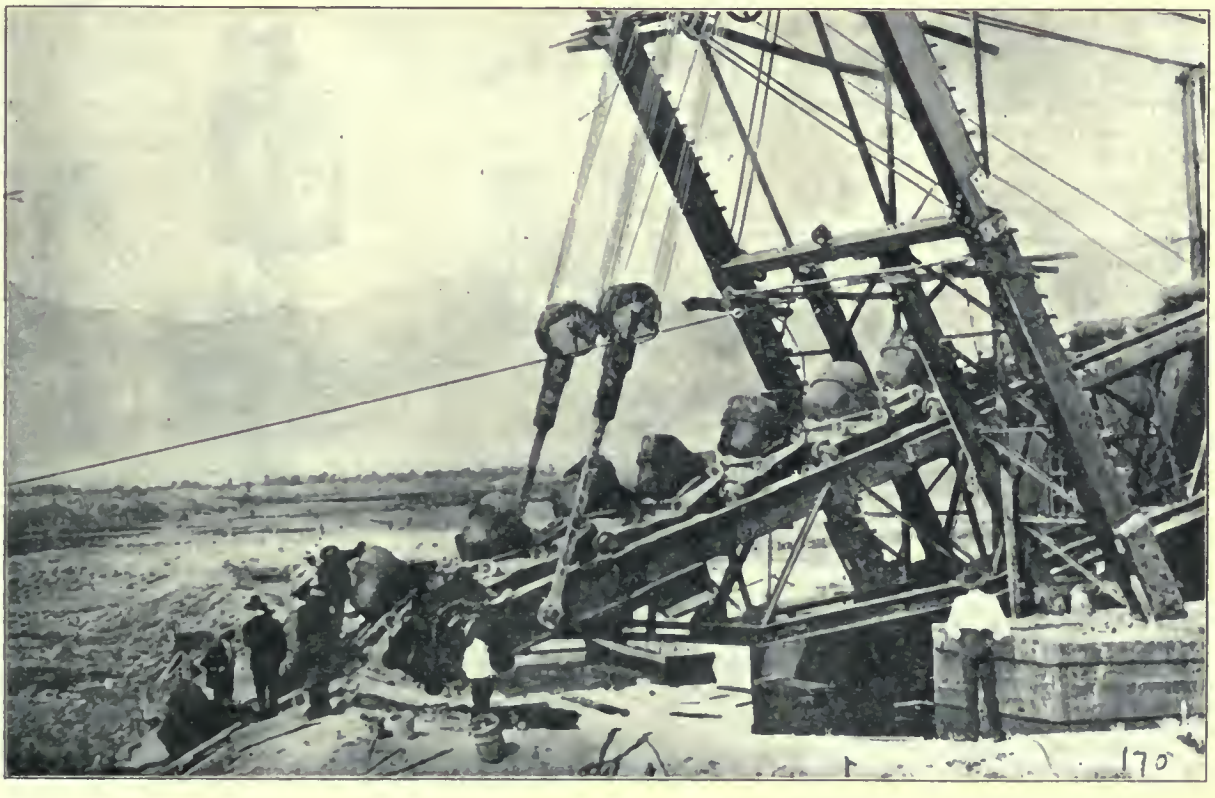


A percussive tool-cylinder, a division-ring dividing the cylinder into front and rear chambers, a piston having front and rear piston-heads, two air-pressor tubes, valveless passages leading from the one air-pressor tube to the front ends of the front and rear chambers and valveless passages leading from the other air-pressor tube to the rear ends of the said chambers whereby the tool-piston may be operated by reciprocating columns of air.

Electricity in Gold Dredging.

The Conrey Placer Mining Co., at Ruby, Montana, has in commission three gold dredges, operating at the mouth of Alder gulch. This locality is celebrated for the large amount of gold produced forty years ago.

Two of the Conrey dredges are operated by steam, one having first started in 1899, the other in 1902. Since then the art of dredging in compact auriferous gravels has advanced so much, and the practice so thoroughly established on safe mechanical lines, that much thought has been given to the perfecting and cheapening of the operating methods. In California it is the general practice to use electric power, but this has been slow of adoption on the Conrey property, owing, first, to the belief that the character of the ground presented difficulties that could be met more readily with the steam power; and, second, to the need of artificial heat, both in water and air, for operation in the winter months. It was decided, however, to equip the next dredge with electric machinery, using a supplemental steam heating for the colder months.



The Conrey Dredge.

Operated by Electricity.

This third dredge is of the single lift, sluice-box type. It was built entirely from designs made by the owners. The hull is 130 ft. long by 48 ft. wide, giving it probably as much if not more area than any other dredge of its kind ever built. It is 8 ft. deep and thoroughly trussed for all the known strains. The ladder-way, or well, in the centre of the forward part, and in which the bucket-chain and ladder work up and down, is 64 ft. 9 in. by 7 ft. 3 in. The ladder is 100 ft. from centre to centre of tumblers. It is of bridge-work construction, built up of angles, a lattice-truss, and a plate-bottom connecting the lower ends of the side flanges. This bottom or cross-plate serves the double purpose of strengthening the structure and providing a trough for some of the slop and spill of the buckets to return to the point of digging under the water.

The bucket-chain is of the open-connected type at present, with 41 buckets and 41 space-links. The bucket complete, with manganese lip and sheet-steel hood, weighs 2,600 lb. The space-link weighs about 1,400 lb. They are all fitted in the back eyes with manganese circular bushings, and connected together with high-carbon steel pins of 5⅝-in. diameter. The upper tumbler is six-sided, fitted with manganese wear-plates and bearing on a 16-in. nickel-steel shaft, the centre line being 31 ft. above the lower deck. On this shaft is suspended the ladder, so that its inclination is constantly the same as that of the chain. On the ladder are 12 steel rollers, 12½ in. diam. The lower tumbler is also six-sided, with face plates and flanges of manganese. It is keyed to a nickel-steel shaft, 13¾ in. diam., the ends of which run in a capped bearing continually filled with oil or grease.

The material excavated is elevated over the upper tumbler, dropped into a steel dump-sheet, where it enters a revolving grizzly, or screen. This is made of ½-in. boiler plate and is 18 ft. 3¾ in. long by 61 in. inside diam., lined throughout with manganese wear-plates. There are numerous openings 4¾ by 6 in. and 6 by 7 in. through which the smaller rocks and finer dirt pass to the sluice-box underneath. The grizzly is set flat, but fitted with spiral angles to drive the large sizes to the discharging end, where they are dropped onto inclined chutes that convey them to either side of the dredge. It is also banded near each end by a heavy locomotive tire, each resting on, and between, two manganese car-wheels. The shaft on one side also carries a gear, which meshes into the train that is finally moved by a 10-h.p. type F Westinghouse induction motor.

The sluice on the upper deck is 28 ft. 10 in. long by 62 in. wide, lined with Hungarian riffles, made up of angles and spring-steel liners. The long sluice on a separate pontoon (40 by 50 ft.) is 135 ft. long and 66 in. wide, also lined with similar riffles. Near the lower end is a set of closely spaced bars, with an opening in the bottom of the sluice itself, permitting a portion of the finer material to be carried into an undercurrent or auxiliary sluice, 54 ft. 6 in. long and 13 in. wide, and lined with wood riffles of the same type. The main long sluice is supported by an angle-iron structural trussing, the whole attached to the boat by a steel adjustable tongue, the connection of the sluice itself being circular, with a pure gum packing fitted between specially designed cast rings to prevent leak or spill. The flume is swung side to side in the pond by means of ¾-in. cables, attached on the pontoon to a manually operated double-drum winch, and to suitable anchorage on shore.

In the well-way also is provided a set of bars, through which the drippings and sippings from the bucket-chains pass to another sluice-box at the forward part of the dredge, provided with necessary riffles. The dredge is swung side to side in the pond by means of ¾-in cables, attached to one

end to the forward part of the deck and leading out to a shore sheave, whence they return to the dredge and connect to a reversible friction type winch propelled by a 10-h.p. type F induction motor of Westinghouse make.

The dredge is held to its work by the mooring line system. This consists of a heavy framing at the rear, on which sets the steel mooring head, revolving on a double ball-bearing and equipped with four sheaves for the lines. These lines are anchored at the corners of a square, about 600 ft. apart. The two forward lines are 1⅜ in. diam., one end being fastened to the mooring head itself, thence running out to a sheave near the anchorage and returning to pass through the mooring head sheave to a large four-drum winch on the lower deck. The winch is equipped with the necessary brakes, friction clutches, etc., weighs about 45 tons in all and is operated by a 30-h.p. type F Westinghouse motor. The two stern lines are one inch diameter and are fastened on one end to the log anchorage, thence running through the mooring head to the winch. When the boat is to be moved ahead after a cut has been taken out, the stern lines are slacked off and the head lines pulled in. The latter also serve to hold the buckets to their work, and the system gives an elasticity for hard digging that is not allowed by the spud method.

The power for the digging is transmitted through a specially built 150-h.p. type F Westinghouse induction motor, capable of 100% overload and a stall of three minutes. It is set on a structural strut connecting the mooring head with the bearings of the upper tumbler; it is pinioned to a specially designed Miller slipping friction, the 7-in. shaft of which is geared to a 10½-in. shaft, carrying a pinion which meshes into the 13-ft. main driving gear on the tumbler shaft. This large gear is of the split hub and run type and weighs 11 tons. There is also provided an auxiliary brake on the friction shaft.

The ladder is suspended by means of two 1⅛-in. lines, working through a double tackle and connected to a Marion hoist, propelled by a 75-h.p. type F Westinghouse induction motor, equipped with a magnetic brake.

To wash the gravel there are one 10-in. Worthington horizontal volute pump, coupled to a 50-h.p. General Electric motor; one 12-in. Morris centrifugal pump, coupled to a 50-h.p. type C Westinghouse motor; one 14-in. Worthington horizontal volute pump, coupled to a 75-h.p. General Electric motor. The total capacity is about 12,500 gal. per minute.

The dredge has a capacity of about 100,000 yards per month, if not more, and operated continually on the 3-shift basis. It commenced digging on September 12, 1906. The gold is fine, flaky, and floury, and is caught by the use of quicksilver freely sprinkled in the sluices.

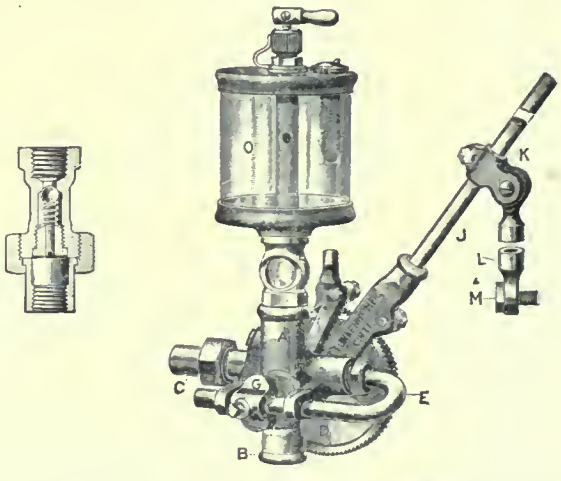
Commercial Paragraphs.

THE HEWITT MACHINERY CO., of 503 Monadnock Bdg., San Francisco, representative for the Atlas Co., state that the Atlas Engine Works of Indianapolis has been awarded a $40,000 contract for the Charleston Navy Yards against the competition of ten other boiler manufacturers.

DENNISTON'S SAN FRANCISCO PLATING WORKS, the old established and successful manufacturers of amalgamating plates, have been in business in San Francisco for 40 years. Their silver-plated copper plates are extensively used in the Rocky Mountain mining region, the Pacific Coast, in Alaska, Mexico, South America, and Australia, to the entire satisfaction of millmen. The demand for these plates is constantly increasing. Only the best Lake Superior copper and refined silver are used, with perfect adherence of silver to the copper, and full weight of silver and copper as per contract. Old plates can be re-plated and made fully equal to new. They are annealed, straightened, and buffed, then silver-plated. Any gold or silver on them is saved. Old plates also are purchased; or gold, silver, and copper are separated at a low cost. The San Francisco establishment was destroyed by fire, during the late disaster, but now larger works have been erected at 1349-1351 Mission St., between 9th and 10th St., which are in full operation, and contain the best and most modern improvements in the business.

An Improved Mechanical Oil Pump.

The Lunkenheimer Company, of Cincinnati, Ohio, are the manufacturers of the pump illustrated herewith, which they have given the trade name of 'Marvel.' As will be seen, the driving mechanism is of the ratchet type, operated by the clutches that work co-operatively by the motion of the rod, which can be attached to the eccentric rod, or other moving parts of the engine by the couplings shown. The motion obtained is transmitted to the piston by the crank-pin mechanism seen on the rear view of the illustration. The ratchet wheel is provided with a handle whereby it can be rotated by hand in case it is desirable to force a quantity of oil at any time, as for example, in starting the engine. The coupling on the rod may be moved up or down, thus lengthening or shortening the stroke of the pump, and regulating the amount of oil fed by the pump, independent of the feed from the oil-cup. Joints of the cup are tight, the sight feed glass being packed so as to prevent access of air that would have a tendeney to cause the cup to feed after the engine had ceased running. This feature and use of



check valves in the pump prevent wastage of oil supply. The feeding of oil is automatic: that is, starting and stopping with the engine. The outlet is connected to the steam pipe or engine valve-chest, and a spring-check valve, supplied with the pump, should be placed in this connection as near as possible to the point of entry into the steam-pipe or chest. The bottom of the pump body is tapped with ⅜-in. bolt-thread to receive a stand so that it can be placed wherever desired. All parts are made to jigs and templets and are, therefore, easily renewed and interchangeable.

The ratchet wheel, pawls, shaft, and yoke are made of tool-steel, tempered and hardened. All other metal parts about the pump are made of the very best bronze composition. Each pump is carefully tested before shipment, and satisfaction is guaranteed. It is listed with and without oil-cup, but it is usually supplied with a Lunkenheimer No. 6, one pint capacity, 'Sentinel,' snap lever, sight-feed cup, and so sent unless otherwise specified. The filling hole is of large area, so as to fill easily, the cup is also fitted with a strainer and hinge cap which cannot be lost. This pump is also made with double-feed and for traction engines, or where a heavy oil is to be fed, the pump is supplied with a compression oil-cup, the oil being forced to the pump by means of a spring actuated plunger in the cup. Where pressure systems have been installed the pump is equipped with a Lunkenheimer 'Reserve' pressure oil-cup, a combination giving perfect satisfaction whenever used.

Publications Received.

ILLINOIS GEOLOGICAL SURVEY.—Bulletin No. 3. This deals with the composition and character of Illinois coals, their distribution over the State, and tests made on them.

ROBINS CONVEYING BELT CO., of New York, issues Bulletin No. 16, describing conveying machinery as applied to the handling of ore. The pamphlet is handsomely illustrated and full of interesting matter, to a degree unusual in trade catalogues. Most of this publication is devoted to illustrated descriptions of important conveyor plants installed by the Robins Co. in large mines, and concentrators.

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Editorial.

THE DAILY PRESS has published an absurd story, emanating from New York, that large quantities of copper lie concealed in storage and that the scarcity of the metal is artificial. A man named Norton is stated to have made some startling disclosures to this effect to the President and Attorney-General. It is a cock and bull story of the worst type, but, while it was widely and prominently repeated by irresponsible newspapers, it was not denied or corrected by them when the yarn had been thoroughly punctured. Yet we doubt not that it is being passed on from man to man among the mining camps, as proof positive of a copper trust.

THE ARTICLE on 'Cornish Tin Mining,' by Mr. H. E. West, will be found interesting, for the revival of activity in that historic region is one of the picturesque incidents in modern mining. Of course, the high price of tin is the chief stimulant, but the confident belief that new methods and larger ideas can reduce the cost of operations is also a decisive factor in causing the introduction of fresh capital. The letters of our London correspondent, himself an experienced miner, have made this clear. Among other features of the movement, we note again the fact that while Cornishmen have taught so much of the moden world how to mine, they have allowed their own place of origin to remain a type of unprogressiveness. This is not so contradictory as it seems, for the Cousin Jack is at his best in finding and breaking ore, not in the treatment of it or in the choice of his surface equipment. If the experience of other regions is now to be applied to Cornwall, it is only a fair return for all the mining knowledge that the Cornishman has given to the rest of the world.

AN effort is being made to secure a Geological Survey for Colorado. The movement ought to have the support of good citizens. Such a survey, if properly organized and sustained, would be of great service to that magnificent mineral region, for in no State has the practical application of geology been so valuable commercially as in Colorado. The Leadville monograph by Emmons stands to this day as the type of the most useful kind of geological work. Structural geology plays a large part in the distribution of ore and in order to obtain the data bearing upon the relation that exists between the ore and its encasing rock, it is necessary to have the aid of thorough scientific investigation. The finding of ore is as much more important than the extraction of it, as it is more difficult. And this applies particularly to Colorado, the character of whose deposits is so diversified. There was a time, twenty years ago, when the U. S. Geological Survey had an office at Denver in connection with the

work done on the Denver basin, Leadville, Silver Cliff, and other localities that have become the subjects of valuable treatises. It is a fact that this office, through the men that occupied it, had a most stimulating effect on economic geology in the State and contributed many ideas that were applied with success in the exploratory work of mining. A similar influence would be exerted by a well-organized State survey and if the office could be kept away from the slimy hands of politics, it would redound to the industrial development of a mineral empire—for such assuredly is Colorado.

The Metal Markets.

The outlook for the industrial metals is excellent and high prices are likely to be maintained. The present price for copper is most satisfactory to producers, but the irregular supply of the metal makes business difficult to the dealers. Metal merchants are besieged by customers who want copper for near-by delivery, making demands that it is impossible to satisfy. Recently conditions have been more normal, and if consumers use good judgment and do not rush into the market, the probability is that the scarcity of copper, which at present is greatly accentuated by the fact that production everywhere is falling off on account of the shortage of fuel, will not be so pronounced as the spring approaches. Generally, during the summer months there is a falling off in the demand and this may help to make both ends meet again, which is desirable. The large demand for copper is due mainly to the requirements for electric appliances, and it is not likely that there will be any material decrease in the requirement from this source. Naturally, as time goes on, the high prices will be felt in a great many directions, and we already hear that for copper sheets, certain kinds of brass, etc., consumers refuse to pay present prices, but this is all out-weighed by the demand for wire. It may be said that nearly all the railroads are seriously considering the question of electrifying their equipment, especially on short distances, where travel is extraordinarily heavy, as, for example, to the outskirts of large towns. The experience, short as it has been, on the elevated lines of New York, and on the New York Central, will prove that a tremendous saving in operating expenses can be effected by electric roads, in spite of the high cost of construction. All this insures high prices for copper for probably a long time to come. On the other hand, the increase in production, which one would naturally expect during a period such as the present, will not come about so quickly. There is a great scarcity of labor, and what makes it worse, all the smelters are suffering from the non-arrival of fuel. Phelps, Dodge & Co., the Greene Copper Co., the Old Dominion, and other large producers, have to shut down every few days. The same is the case with the Granby smelter, at Grand Forks, and the British Columbia Copper Co., and now even Butte is suffering.

In spite of the heavy output, there is not sufficient lead produced in the United States for present consumption, and foreign lead constantly finds its way over here, notwithstanding the protective duty of 2⅛ cents per pound. It may be assumed that with the present high prices, the production of ore is as large as it can be expected, and if supplies are not large enough now, what will they be if lead should decline one cent or 1½ cents. This contingency therefore is rather remote.

When the price of spelter reached 5½ to 5¾ cents per pound some time ago, there came complaints from all the galvanizers that the demand would fall off considerably. Meanwhile, production has greatly increased; the price has gone up to 6½ cents at St. Louis, and there is actually a scarcity of near-by spelter. The brass mills have never been known to require as much of this metal as they have during the last six months, and the largest galvanizers are in the market practically every week to buy whatever is offered. It is obvious, therefore, that prices are apt to remain stiff.

How Mining is Discredited.

A trustworthy correspondent writes to say that our remarks on gambling in the shares of mines at Cobalt were "quite mild," in view of the facts. And it may be added that he writes not as a pessimist, but as a mining engineer who has strong faith in the prosperous future of the district. He says: "The Green Meehan mine is capitalized at 2½ million $1 shares. They are selling at $1.40, or a valuation of $3,500,000. Now, as a matter of fact, the mine consists of two open-cuts showing three to six inches of rich ore, but there is practically no ore blocked out, no shaft, or underground work of any sort. Forty-acre lots adjoining the Green Meehan are selling for over $100,000 apiece, with actually not a pound of ore. The Silver Queen mine, with a shaft not 200 feet deep, stands at a valuation of 3½ million dollars. The Silver Leaf, selling at a valuation of $1,000,000, has not a pound of ore in sight. And so on. It is absurd; the bottom will drop out, and before long. A claim with an inch vein of calcite will sell here for from $30,000 to $100,000, according to location." Unbiased statements such as these show the length to which irresponsible promotion can go. It is called 'mining,' but it is no more legitimate industry than the shady practices of the turf are part of the breeding and racing of horses. Speaking of such matters, we desire to refer to a letter on Greenwater that we recently published, much to the annoyance of people who are known as 'boosters.' Two contemporaries undertook to lecture us on the proprieties of journalism, and to them we venture to suggest that they teach their grandmother the pneumatic extraction of the albuminous contents of an egg. Life is too short for a reply to periodicals that are the organs of the unscrupulous kind of finance that is hurting real mining. Greenwater may furnish one or two profitable mines, just as Cobalt can boast several splendid bonanzas, but that does not get away with the fact that both are the scene of a great deal of bunkum and chicanery, holes in the ground being sold as rich mines and hungry prospects as proved properties. The honest enterprises will take care of themselves; we are simply doing a little to create a healthy public opinion, and to prevent the prostitution of a beneficent industry.

By the Way.

In a recent address before the People's Forum, at New Rochelle, Mr. Jacob G. Shurman, president of Cornell University, discussed 'Individualism *vs.* Socialism.' He said:

In recent times in all progressive countries the functions of government have been considerably enlarged. In the United States, for example, the view of government that has hitherto prevailed is that of an institution for the protection of life and property. It rested on the very wise theory that the less men were governed the better. But the growing complexity of modern life and the multiplication of material commodities and the varying conditions under which they are produced and exchanged have compelled modern legislatures to enact laws on subjects not only inconceivable to their fathers, but transcending the limitations set by them for the scope of governmental activity. This necessity has produced a change in our attitude toward the State. We have come to think of it, perhaps in an exaggerated and dangerous degree, not merely as an institution for the protection of its citizens in their rights, but as an association for the positive promotion of the common interests of all its members.

Laws for the protection of working people, and for the improvement of their condition, have rapidly increased, both in the United States and in Europe and Australasia. The lead in this so-called 'State socialism' was taken by Germany, which adopted measures for the insurance of workmen against accident, sickness, and old age. New Zealand, under the leadership of the late Richard Seddon, went still further in the same direction, and established in addition a system of compulsory arbitration in labor disputes. In this country and in England factory legislation may be mentioned as an illustration of the same tendency. And, in a different field, the Federal Railway Rate bill, Pure Food bill, and Meat Inspection bill of last year, with their recognition of the need of Government supervision of certain kinds of private property, were by many people regarded as another example of State socialism.

For my own part I will add that the presumption is always against any extension of the functions of government, as government is already overburdened and the men who conduct it are not equal to the growing task, being neither demi-gods nor heroes, but mere human beings, little, if any, above the average of their fellows either in ability or character. No fallacy is more pernicious than the complacent assumptions that a problem is solved when the task of solving it is put on the President or Governor, Congressman, or Assemblyman, or some lower official of their selection or appointment. The State is not a wise, benevolent, and all-powerful earthly Providence. Concretely realized the State for us is President Roosevelt, Senator Platt, Gov. Hughes, Mr. Murphy, and a number of other political leaders and public officials of similar or inferior standing and influence.

It is a widespread belief that certain political, social, and economical evils can be obviated or mitigated by public ownership of industries which in their nature are monopolistic. Under this conviction cities have become owners of waterworks, gas, and electric light plants, tramways, and street cars, and States have purchased or constructed railway, telegraph, and telephone systems, and even undertaken the business of banking and insurance. * * * Now, I do not understand that any appreciable advance toward the millenium has anywhere resulted from the municipal or State ownership of public utilities, though I am far from opposing that system of ownership. On the contrary, I know that if in Germany you want a good train on a Government railway you must take one run by a private company which has its arrangements with the Government. I know that in London, where municipal ownership had been carried almost to an extreme, mismanagement, especially in connection with the street cars, the river boats, and the electric service, entailed such enormous municipal debts that the rates or municipal taxes were greatly increased, and the supporters of the municipal ownership policy were overwhelmingly defeated at the elections only a few months ago. I know that in Russia, which is the most perfect exemplar of State and municipal ownership, you find as a consequence a highly centralized government and a corrupt beaureaucracy which is not only morally reprehensible, but which yields in practice the worst service in the civilized world.

I do not want to see a Government despotism in the United States. I dread the bureaucracy which Government ownership of American railroads would make inevitable. I can see nothing but folly in a policy which would call for Government loans of billions of dollars to purchase the railroads and which would entail the loss of billions of dollars in mismanagement and corruption under political control after the roads had been taken over by the Federal and State Governments. No Government in the world is qualified to go into the railway business, and least of all the Government of the United States, which draws its life from party politics and in which all administrations are necessarily short lived.

We have witnessed in the last two or three decades an enormous increase of wealth in the United States. All classes of the community have profited by this enrichment. But the feature of this economic phenomenon which stands out most conspicuously, which attracts all eyes, which throws everything else in the shade, is the large and, in some cases, colossal fortunes accumulated by certain individuals. This feature so completely obliterates all others that many thoughtless and ignorant people assume that impoverishment of the many has resulted from enrichment of the few. Others, again, suppose that the fortunate few have robbed them of opportunities of becoming wealthy by monopolizing fortunes of which they were entitled to a share. All this vague thought and sentiment rests on the tacit assumption that wealth, like dirt, is lying round and needs only to be picked up, and that one man has as good a right to pick it up as another.

The fact is that wealth is a creation. The colossal fortunes of the millionaires and billionaires, excepting, of course, those that have been dishonestly acquired, are positive contributions to the sum total of human wealth. These fortunes have been created from possibilities of nature and human society divined by the genius and organizing ability of great captains of industry. The rest of us would not be the richer, but poorer, had these men of economic genius not created their vast fortunes. And I have no doubt that in the material world and in the needs of human nature there are still infinite possibilities of wealth open to any of us who have the genius and skill to utilize them.

Does anyone pretend that the United States would today be a better country to live in if we were all poor, if there were no millionaires and billionaires, or if the sons of millionaires and billionaires squandered the wealth which their fathers had accumulated? The very question reveals the folly of the underlying assumption. What we want is not a diminution in the wealth of any individuals or a reduction in the number of wealthy men, but an increase. And every increase is so far from being a detraction from the prosperity of others that in its results it is a boon to them and to the community.

Mining Summary.

ALASKA.

(Special Correspondence).—The Alaska Copper Co., at Coppermount, has a 250-ton matte smelter at its property, which operated four months last year. Its present idleness is due to an insufficient coke supply. At the mine a long adit is being driven to open the sulphide orebodies. This will cut the vein 1,100 ft. below the apex of the mountain, and 1,200 ft. above sea-level. The property, which is directed by an executive committee, has an office in Seattle. —— C. L. Parker, and associates, of Seattle, are mining on Cleveland peninsula, on Helm bay, in the Ketchikan district. Their property is well opened by adits, and there is a winze on the lode that yields gold ore. The surface improvements comprise a five-stamp mill, now in operation; a gravity tramway from mill to mine, and a railroad from the water-front to the mill. The ore is, in part, free-milling, the balance being concentrating.

Portland, Feb. 1.

Recent reports from Candle City state that there are over 100 people living there this winter, and that there are fully 400 miners on the creeks in that district, and 45 more on the Kugruk, which is 25 miles distant. Guinan, McDonald, and McIntosh are carrying on the most important operations. One dollar to the pan at bedrock is not uncommon on their property, and the small buckets used for hoisting average about $5. Coal for the mines is brought from Kugruk creek. Two steam-hoists and 15 men are working for this outfit on Candle creek.—— A rich strike is reported on Montana creek, a tributary to the Kugruk. A 24-h.p. boiler has been installed there. A new $4,000 hospital has been built in Candle, by subscriptions from the miners.

Extensive prospecting is being done on Solomon river. A number of outfits are at work with steam-boilers, and bedrock has been struck at a depth of only 15 ft. The shallow bedrock makes development easy, and the gravel is easy to handle, being coarse, but without many large boulders. At Nome, the first beach line, which lies about 1,500 ft. back from the sea, is showing up well, and seems to extend from Snake river to Cape Rodney. Strikes have been made averaging 12 and 15 ft. below the surface, running about 10c. per pan. The shallowness of the pay-streak makes it easy to work.—— The vicinity of Bluff is being prospected vigorously, on the third beach. Lapelle is taking out a dump, from ground of the Northern Mining Co. The beach is over a mile back from the sea, and 20 outfits are working, although only a few are down to bedrock.—— Many outfits are working on the third beach from Anvil creek to Penny river. The Wild Goose Co. is the only one that has yet reached bedrock.

All of the mines and mills of the Treadwell system have been closed, owing to lack of fuel. The Treadwell mine and the 240-stamp mill were the last to suspend operations.—— The Treadwell management is putting in oil burners, and in the future the mine will be operated with this fuel. An independent line of tank-steamships will be run by the company.——The Treadwell mines employ about 1,500 men, and the Perseverance about 100 men.

ARIZONA.

GILA COUNTY.

(Special Correspondence).—The Blackhawk and Copper Hill mines of the Arizona Commercial Co., in the Globe district, which have been idle for some time, are being worked, sufficient fuel having been secured.——The reduction works of the Old Dominion M. & S. Co., which have been closed since the first of the year on account of the shortage of fuel, have resumed operations with two furnaces. Coke and fuel are arriving daily and the other furnaces will soon be started. The shaft on the Gem claim of the Globe Consolidated Co. is at the 370-ft. mark and is in diorite. It is expected that the 500-ft. level will be reached within three weeks and from this point lateral development work will begin.——Orders have been placed for machinery for the claims of the Superior & Boston Co. W. E. Carter is foreman, and he will also have charge of development work on the Great Eastern, Black Oxide, and Limestone mines.—— At the Mallory mine, the vein on the 460 level is being explored at three points by drifts. About 40 ft. of driving has been done along the vein. The ore runs from 1 to 5% copper.——The railroad being built by the Arizona Commercial Co. to the Copper Hill and Blackhawk mines is awaiting construction material. About a mile of steel has been laid.

Phœnix, Feb. 3.

GRAHAM COUNTY.

An important deal has just been made in the Clifton-Morenci district. Los Angeles capitalists have purchased or bonded a large area in the centre of the mineral belt, made up of about 160 claims. This deal includes the properties of the Stevens Copper Co., consisting of 48 claims; the Julius Lezynsky group of 34 claims; and the Elliott-Wright group of 27 claims. With the consolidation of all these properties, this new company will have holdings on each side of Chase creek, and extending from the west side of American Mtn., near Eagle river, to the region east of Metcalf, and nearly to the Frisco river.——Owing to the high water in the Frisco river, which interferes with the improvised pumping plant of the Arizona Copper Co., the smelters were forced to close down for a short time. There has been considerable difficulty in getting sufficient water to run the plant of this company, ever since the washing away of the old dam across the Frisco river in December.

MOHAVE COUNTY.

At the property recently purchased by New York capitalists from C. G. Werner, work is progressing rapidly. The mine is situated in Box cañon, 18 miles northeast of Florence. The tunnel when completed will be about 1,200 ft. long, and will cut the Arizona King vein at a depth of about 500 ft. An air-compressor, boiler, and machine drills have been ordered.——A carload of copper glance rich in silver has been shipped from the old Queen mine at Superior. The ore was taken from the 300-ft. level. This district has produced some rich ore, the old Silver King having been famous as a high-grade shipper.——Thirty men are employed by the Picacho Mining Co. The mine has been bailed out, and men are driving on the 200-ft. level. The railroad from the mill to the mine, a distance of five miles, is being put in shape.

SANTA CRUZ COUNTY.

There is a good deal of activity near Patagonia. The Happy Jack Mining Co. has a tunnel in 900 ft. Ore is being shipped regularly.—— The Pride of the West in Washington camp is shipping good ore, and the old Mowry mine is turning out a good amount of lead and silver bullion. The Alta mine, about 12 miles northwest of Patagonia, is sending ore to the El Paso smelter.——The Mansfield company has a shaft down 160 ft.——The Gringor company has a 5-stamp mill running and will add 10 more.——The Presidential property, about one mile southwest of Mansfield, has a good showing of ore, and 12 men are employed. ——The Santa Cruz company is working a force of men on its property, two miles east of Patagonia, and has a shaft down 350 ft.——The Flux mine is producing lead carbonates, as is also the Hardshell property, both owned by R. R. Richardson and now under bond to California parties.—— The Dawson mine, 10 miles northwest of Patagonia, has just struck good ore in the foot-wall. This property has been operated by W. P. Blake, of Tucson, for four years.—— A consignment of ore has been shipped to the El Paso smelter by the National Consolidated Mining Company.

CALIFORNIA.

BUTTE COUNTY.

At a recent meeting of the operators in the Oroville dredging field, the subject of the injunction suit threatened by the Anti-Debris Association was discussed. No objection was made to the muddy water which finds its way into the river by percolation, but the Anti-Debris Association does object to the open ditches from the dredgers and dredging ponds, which run directly into the river. Another point is the fact that there are no restraining walls to prevent the river, at high water, forcing its way into the ponds and tailing piles, and carrying down stream a load of gravel and sand. A stay of proceedings has been granted to the operators, until they can investigate the grievances of the Association.

EL DORADO COUNTY.

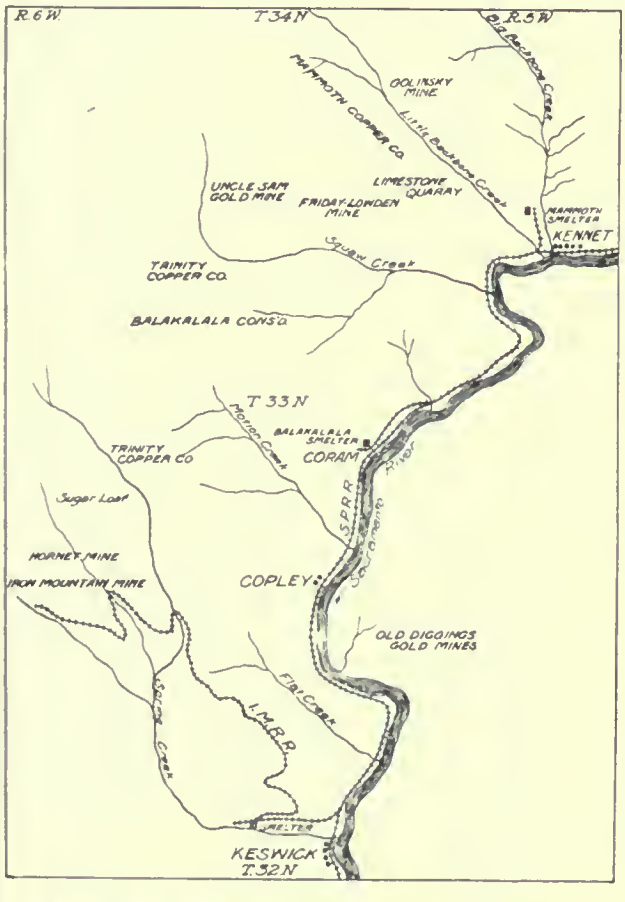
The El Dorado canal is still clogged with snow and ice, none of the mines are able to run, and the machinery at Placerville is only being run for temporary purposes.——All the mining in Consumnes township is stopped by a break in the Plymouth ditch. It will be six weeks before much water can be obtained for mining.

INYO COUNTY.

On Feb. 10, a new agency station, named Sperry, will be opened at the end of the track on the Tonopah & Tidewater railroad, three miles north of Dumont (the present terminus), and 78 miles north of Ludlow, Cal. Thereafter Dumont will be a non-agency station, and freight consigned to that point must be prepaid. All freight and passenger business for Greenwater and points beyond the end of the track should be routed to Sperry, as all freighting lines and stages will arrive at and depart from that point.

NEVADA COUNTY.

The new power-line from Colgate to the Boss mine, near Sweetland, has been completed.——Prospecting is still going on at Iron Mtn., and cross-cutting has been started, to cut the copper lode.——The Colfax mine at Willow valley has developed good ore in the lower tunnel, about 400 ft. from



Map of the Copper Region in Shasta County, California.

the portal. A shipment of high-grade ore will be made soon to the Selby plant.

PLUMAS COUNTY.

The coming of the Western Pacific railroad is expected to open up a rich district in the northern part of this county. The Plumas-Eureka at Johnsonville has a good record as a producer, and the railroad will open up the Greenville mother lode district, ranging from Taylorsville, through Crescent Mills, northward to the head of Wolf creek. To the west is the Seneca district, which will also be reached by the new road. Free-milling gold-quartz has been found there in many places. The Indian Valley region has some good copper lodes, especially in Lights cañon.——The old Gruss mine, at Ward creek, has produced half a million in gold, and a tunnel has been run 1,400 ft. on the lode.——A tunnel has been driven into Cooper hill, and Salt Lake parties are large owners in the district.——The North California Mining Co. has done a great deal of prospecting along the northern and western boundaries of the county, and has built many trails and roads.

SHASTA COUNTY.

Another strike is reported in the Lappin mine, near Deadwood. A two-foot lode was struck in a cross-cut, and is followed by this new strike in the shaft. Sixteen men are employed, but no stoping or milling will be started until the spring.

The Keswick smelter is to be repaired and blown in again. Probably but two of the five furnaces will be overhauled at once, with the idea of keeping one furnace running continuously. Low-grade ore from the Hornet mine will be treated, as well as some from the Iron Mountain, and the resultant matte will be shipped to the Martinez reduction works, which are owned by the Mountain Copper Co. The restoration of the smelter is rather a large undertaking, as much of the machinery was removed to Martinez. Pipes were disconnected, hot-air blasts torn down, six McDougall furnaces were removed, motors shipped away, and wiring taken down. Nevertheless, two of the furnaces are expected to be in shape inside of two months. Lewis T. Wright is the general manager, and F. H. Goodspeed is the superintendent of construction.——It is reported that within a few months a test run will be made in smelting iron by an electric furnace process, in the preliminary plant now being constructed by H. H. Noble on Pit river.

SISKIYOU COUNTY.

(Special Correspondence).—The Blue Ledge copper mine, bonded to Robert S. Towne, of New York, has undergone thorough development within the past year. Five adits, from 200 to 800 ft. in length, have been driven. Besides this, over 7,000 ft. of diamond-drill prospecting has been done. The ore carries 5% copper, $2.50 in gold, and $1.50 in silver per ton, the orebodies occurring in the schist and slate. Mr. Towne has expended $200,000 on the property, and it is anticipated he will take up the bond. The mine is 35 miles from Medford, Ore., and 120 miles from the coast. A railroad may be built to the mine and a smelter erected there.

Medford, Feb. 3.

(Special Correspondence).—The Alta Con. M. & M. Co., operating on Hungry creek, six miles from Coal station, will complete its mill this spring, and treat its ore by amalgamation and cyanidation. O. C. Tiffany of Ashland, Ore., is manager, and Frank Morin, of McLeod is interested. H. Crouch will have charge of the mill.

Ashland, Feb. 6.

TUOLUMNE COUNTY.

(Special Correspondence).—The Horse Shoe Bend Gold Mining Co. has purchased a 40-stamp mill and will erect it on the property, situated on the Stanislaus river, as soon as the weather permits. The company will continue development the coming spring.——The Yorktown mine, situated on the Ida Klein ranch, near Stent, which has been attracting attention as the result of a rich strike, has passed into the control of F. B. Keever, of Boston. A hoist and other machinery will be installed at once, the crew increased and development pushed at a rapid rate. J. F. Bryson is superintendent.——The Pennsylvania shaft of the Soulsby mine has reached 800 ft. and driving on this level was commenced a few days ago. The shaft is 400 ft. deeper than when the Bagdad-Chase company began operations. At the Davidson shaft of the Soulsby a new concrete foundation has been placed under the machinery which operates the jackhead pump.——It is said operations will be resumed at the Kanaka, Fair Oaks, Prudhomme, Del Monte, Mt. Jefferson, and the Cosmopolite. Operations ceased at the latter mine only a few weeks ago, as a result of the severe weather. The Mt. Jefferson will be in activity as soon as electric power is available, which will be about May 15.——Negotiations for the sale of the Black Oak mine, near Soulsbyville, are reported to be in progress.——The Imperial Gold Mining Co. has filed articles of incorporation in this county. The capital stock is 1,000,000 shares of $1 each. The amount subscribed is given as $350,000. The directors, thirteen in number, are all residents of San Luis Obispo county.

Tuolumne, Feb. 3.

COLORADO.

BOULDER COUNTY.

The main shaft of the Pine Grove mine, near Wolfram Junction, is down 180 ft., and is being sunk fast. The shaft is going down on the main vein, which is often six feet wide, and carries some shipping ore along with the second-class. Levels have been opened at 80 and 160 ft. J. Collins is the superintendent.—— The Spencer Mountain Tunnel Co. is working steadily in the east branch of the Mogul tunnel. Six thousand feet of workings are now open, and the adit is designed to drain all the mines of Spencer, and is expected to cut the veins at a depth of 1,000 ft. J. A. Gilfillan is the superintendent.—— The Alton company has completed 650 ft. of the tunnel which is to be driven 3,000 ft. under the Sherwood flats, and work is progressing rapidly. Hand-drilling is done now, but the company expects soon to install a compressor. At a recent meeting H. R. Burns was elected president; W. A. Burke, treasurer; H. F. McClellan, manager, and Jas. Cheney will be the superintendent.——The shaft of the Livingston property, at Sugar Loaf, is down 300 ft., and will be pushed to the 1,000-ft. level. This mine is reputed to have already produced $400,000 in gold.

CLEAR CREEK COUNTY.

(Special Correspondence).—Great activity prevails in the Georgetown district, and a number of concentrating mills are being built. The machinery for the East Griffith mine was put in place this week and there are enough lead and zinc-ore reserves to insure a steady output. The Democrat Mountain Mining Co.'s new 50-ton mill has started, and is doing good work. Ores from the Boston and Beecher lodes, cut in the Moline and Kelly tunnels, are being treated. The Nashatah mill, situated below the portal of the Diamond adit is running, and from 100 to 125 tons of dump material are being concentrated daily. This is said to be one of the most modern plants in Clear Creek county. Work was started last week upon the Homestake group of six claims, situated on Lincoln Mtn. The cross-cut, now in 40 ft., is to be driven with all possible speed. The first lode to be intersected is the Homestake, 50 ft. distant, which from surface produced high-grade gold-silver ores. A new strike is reported from the Ramsdell mine, also situated on Lincoln Mtn. In shooting into the hanging wall a 10-in. streak of ore was uncovered which assays 20 oz. gold and 120 oz. silver per ton. George W. Teagarden is the general manager. The Doric tunnel property which has been idle for the last two months, will again be operated, and stoping on the Magnet and Sequel lodes will be resumed. In both stopes a streak of fair-grade ore is showing, which can be mined at a profit. Riley Bros., leasing on the famous old Stevens in the West Argentine district, have uncovered an 18-in. streak of silver-lead ore. The first shipment of five tons brought returns of 60 oz. silver and 55% lead. Stoping is in progress. John Bowen, leasing on the upper Frostberg on Sherman Mtn. will start shipments within the next 10 days. A drift is in 100 ft. and the ore-shoot has been found. The streak is 18 in. wide and carries silver values of 150 oz. per ton. Steady shipments mark the progress of development on the Smuggler, located on Brown Mtn. The average value of the smelting material is $100 per ton, while the concentrates bring about $50 per ton. A number of leases have been issued on the property and every lessee is working. Work in the Crowfoot adit has been resumed. The bore is now in 4,800 ft. Wm. M. Cooper is the manager. The ore-body in the lode intersected measures from 5 to 12 ft. in width, carrying from 2 to 3 oz. gold per ton. Hundreds of tons are in the ore-bins, but owing to the crowded condition of the custom mills it cannot be handled. A mill of a capacity of 200 tons per day is to be erected at once for the treatment of this material. This property is within the corporate limits of Georgetown. Carl Nelson, leasing on the Gold Dirt, has a body of ore eight feet in width, carrying values of 4.4 oz. gold per ton. Shipments are being made to the Denver smelters. These lessees have a block of ground 350 ft. long by 300 ft. deep. One foot of smelting-ore has been opened on the Denver City property on Coyote Mtn. The discovery was made at a distance of 500 ft. from the portal of the cross-cut, where the Louis J. lode was intersected. The values will probably average $50 per ton, principally in gold. The Philadelphia Gold Mining Co. has been incorporated with a capital stock of $100,000. The company will operate a group of 17 claims on the south slope of Bellevue Mtn. The Little Chief cross-cut is to be continued. Jos. Boyd is manager.——Operations have been resumed on the Prince Albert mine located on Columbian Mtn. Shipments were started to the Georgetown sampler this week, the ore bringing $40 per ton. D. J. Williams of Lawson is the superintendent. A contract was awarded this week for running the two lower adits on the Stemwinder 200 ft. further. The lower level is being driven east from the bottom of the shaft at a depth of 35 ft. It is hoped to again catch the shoot from which ore running 325 oz. per ton was extracted a few weeks ago. Work on the Ramsdell mill was started this week. The contract calls for the completion of the same within 90 days. The capacity is to be 75 tons daily, straight concentration.

Georgetown, Jan. 31.

SUMMIT COUNTY.

(Special Correspondence).—The Colorado Consolidated Electric Co., which last year took over the property of The Gold Pan M. & M. Co., has given an option on all of its holdings to Ben. S. Revett, the dredge operator. The option covers all water rights, ditches, flumes, pipe lines, manufacturing, electric power, and lighting plants and machine shops. It is Mr. Revett's intention to supply his dredge on the Reliance property in French gulch with electric power and to operate dredges on the Blue and Swan rivers by electricity. It is estimated to take 200-h.p. for each dredge. This, with the lighting of the town of Breckenridge and the supply of power to mining plants will use all the power that can be generated.——Robert A. Niles, who has had charge of the Blue Flag Mining Co.'s affairs since its organization, has resigned from his position as superintendent and is succeeded by Charles M. McGrew. Mr. Erisman, the president, visited the property last week. Milling operations will be resumed in the spring.

Work on the Senator mine is being carried on under the supervision of M. M. Howe, and a force of 20 miners are employed. No shipments will be made until the road is opened up in the spring.——The Wonderful London mine, is being developed at depth. A force of 15 men is employed and the main shaft is now down 500 ft.——The Puzzle Gold Dust mine is under new management. W. A. Walker of Mt. Pleasant, Ohio, has been appointed manager, and the superintendent is John B. Nelson. A large body of lead and zinc ore has been struck in the raise above the main tunnel level. This will provide ore for the concentrating mill which is soon to be started.——The Wellington Mines Co. is employing a force of 25 men. Loading chutes have been built, and six teams are hauling ore.——The Maize Co. is doing work on Rock Creek, north of Dillon, on the Boss and other lode-claims of their group. The main tunnel has intersected the old Boss vein at depth, and a body of silver ore has been opened.

Breckenridge, Jan. 23.

IDAHO.

BLAINE COUNTY.

(Special Correspondence).—The Wood River Zinc Co., operating near Hailey, under the management of John Williams, has been for some time shipping six cars of ore per month from its Nayaug mine, which yields 50% lead, 60 oz. silver, and $12 gold. The zinc ores have accumulated to the amount of 30,000 tons. The latter ore carries lead, silver, and gold in addition to the zinc. It will now be milled.

Portland, Feb. 1.

LEMHI COUNTY.

(Special Correspondence).—Definite information has been received that the Oregon Short Line will build a line this year from Armstead on the Utah Northern to the Gilmore district in Lemhi county, a distance of 70 miles. The Gilmore property and the properties of the Junction Mining Co. have been consolidated and a large smelting plant is to be erected. Ore from the Gilmore has heretofore been hauled 70 miles by wagon.

Spokane, Jan. 20.

SHOSHONE COUNTY.

(Special Correspondence).—The Champion Co. has been incorporated for $1,250,000 to develop a group of 12 claims north of Mullan and Snowstorm hill. The officers are: C. H. Reeves, president; F. H. Harper, vice-president; M. R. Keith, secretary; W. S. McCrea, treasurer. The foregoing, with E. J. Harper, Al. Harper, and J. T. Ome, constitute the board of directors. The property has been developed, and a well mineralized vein of good proportions has been exposed. Work will be begun at once under F. H. Harper on a tunnel which will run 1,200 to 1,500 ft. to crosscut the level at depth.—— R. H. Pascoe, superintendent of the Standard mine, is authority for the statement that an important strike has been made on the International. The managers of the property claim they have struck the Hercules lead. The International is east of the Hercules, and is separated from that property by only one other—the Ajax. The principal owners are: H. F. Knight, Wallace; R. H. Pascoe, Mace; W. J. Hall, and Ellis Hale, Wallace.—— A strike of three feet of miling galena-ore has been made in the Arlington mine, six miles east of Burke. The lode carries three inches of shipping ore. Cyrus W. Gossert, of Wallace, is president of the company. Much of the stock is held by Boston people. The same lode was opened 500 ft. higher on the hill, so the recent strike gives the mine an immense stoping ground. The strike was made when the lower tunnel was in 70 ft. The company owns 20 claims.—— Word from Wallace states that a smelter will be built at Mullan by Eastern and Butte capitalists, and the Greenough interests. Frank D. White, superintendent of the Amador smelter, announces that a location has been selected just east of the Snowstorm mill. The smelter company will erect a long aerial tramway to Copper mountain to handle the ore from the producers of that district, and the Hunter mine will send its ore to the Mullan smelter.—— At a meeting of the directors and shareholders of the North Franklin Mining Co. in Spokane, it was decided to increase the par value of the company's shares from $1 to $5 per share. The company is incorporated for $1,000,000, and the treasurer was required to file a bond for $25,000. The property of the company is 800 ft. north of the Morning mine at Mullan, and arrangements have been completed with the Federal Co. by which a supply of air is conducted from the lower tunnel of the Morning mine to the North Franklin property, and in this way the installation of a compressor is not necessary. Three shifts of men have been employed for some time.—— Contracts have been awarded to S. W. Merrill to drive a 500-ft. tunnel on the property of the Nonpariel Co., which lies south of Mullan, adjoining the Carney property. The surface buildings have been completed and work will be pushed. The contract stipulates a minimum of 50 ft. of work per month. The tunnel has been started on the vein, and when continued for 3,000 ft. a depth of 1,420 ft. will be had on the vein. The iron on the surface carries from 8 to 10 oz. silver, and from 1 to 1½% copper.——The Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 112 of $180,000 Jan. 4. This makes the total amount of dividends paid to date $8,046,000.—— The option on the control of the stock of the Rex, held by F. J. Finucane, supposedly in the interests of the Federal Co., has been surrendered.—— An assessment of five mills per share has been levied on the stock of the Oom Paul Mining Co. This assessment will bring into the treasury nearly $5,000, which will be enough to carry the workings into the orebodies. A compressor has been installed.—— The Yellowstone group of three claims adjoining the Copper King mine, near Mullan, has been bonded to E. J. Hunter, of Spokane, who will incorporate a company to handle the property.—— Herman Hueman, of Wardner, and Richard Emmons, of Galena, Kans., will install a tailing plant at Wallace. It will treat 15 tons of tailing daily, hoisting from the river bed by two 14-in. buckets.—— A strike of rich galena-ore was made in the upper workings of the Daisy mine, near Mullan, a few days ago. The orebody varies from 18 in. to two feet. The mine was acquired by the Greenough interests two months ago.—— J. C. Jensen, superintendent of development work now being done on the Lewiston group in Moon gulch, reports a strike of importance. In the lower tunnel, which is now in 95 ft., a fine body of galena-ore has been encountered.—— The Assaska Mining Co., a new corporation, has purchased five claims in the Cœur d'Alene district from J. H. Marks. The property was secured for $75,000, the seller taking stock in the company for a large part of the purchase price. The new company is composed of Spokane men, with J. H. Marks, president; W. Steffer, vice-president; S. J. Crane, secretary, and B. N. Hodson, manager. The company's property has been developed by a 200-ft. tunnel and a number of open cuts and shafts.—— Copper ore has been found in the Log Cabin mine in the Black Lead district in the Bitter Root Mtn. H. Gerber, one of the owners, says the Log Cabin ore is similar to that of the famous Murray producers. The ore carries some native copper, and values in gold and silver.—— At a meeting of the Transcontinental Mining Co. the following board of directors was elected: President, W. W. Woods; vice-president, Frank Hutchins; secretary-treasurer, George E. Marlowe; directors, W. W. Bixby, and Thomas C. Marshall, of Wallace. George E. Marlowe was appointed manager. The company owns nine claims in the Hunter district, 400 ft. north of the Reindeer. The property is traversed by a strong vein, and assay returns of ore taken from the grass roots give 4% copper, and 3½ oz. silver.—— The Crescent mine, a few miles east of Pierce City, is to be worked again, and active development work will begin early next month. R. E. Willoughby has purchased the mine from the Bone Mining Co., to which corporation the property has belonged for years. The price paid is $20,000. The property is well developed by tunnels, shafts, and pits, and is equipped with a five-stamp mill, a sawmill, hoists, and other machinery.

Spokane, Jan. 30.

NEVADA.

ESMERALDA COUNTY.

The shaft on the Frances lease of the Polverde claim of the Jumbo extension is being sunk. The 50-h.p. hoist from the Frances-Mohawk lease has been installed, and an eight-drill compressor will be used. A station-pump, electrically driven, will be placed on the 300-ft. level, to take care of the recently encountered water.——The report that the Consolidated company had asked the District Court to stop work on the Jumbo Extension until the apex-rights to the orebody had been determined is denied. Apex litigation between the Mohawk and Combination mines was avoided by the purchase of the latter by the merger company.

LINCOLN COUNTY.

(Special Correspondence).—The Vincent mining district (unorganized), situated 25 miles southeast of Los Vegas, has produced ore rich in gold. The Catlin property has three tons of ore sacked ready for shipment and is sacking more. This property is reported sold at $60,000. A Hartford, Conn., syndicate is working in this district, and reports having encountered some rich ore. Thos. Hays, of Salt Lake, also reports a rich strike, and the district looks lively.——Gravel Gulch is shipping rich copper ore from Moapa.——The Vegas Copper Co., 30 miles southwest of Los Vegas, will sink a 100-ft. shaft. A small shipment of 10% copper ore was made from this property.——The Lucky Strike, 25 miles northwest of here, made a small shipment which returned 70% lead.——The Potosi, 25 miles southwest, continues to ship 35 to 40 tons per day of lead and zinc ore.——The Vegas Artesian Water Syndicate is loading machinery at Los Angeles, and will shortly commence its first bore, two miles from here.

Los Vegas, Jan. 29.

(Special Correspondence).—The Searchlight Consolidated Co. is grading for the foundations of its new plant, and machinery is on its way. Owing to the scarcity of lumber in the district, Mr. Egge, the superintendent of the property, has ordered the material for the head-frame from Los Angeles, and the first carload will be received this week. In addition to the hoisting plant, the company has ordered a full equipment for a machine shop, and will be prepared to do lathe work, and will have the best and most complete mine equipment in the district. Considerable difficulty has been experienced in sinking the shaft, as the ground was heavy and had to be timbered closely.—— John Hug-

gins, who has charge of the Quaker City group, is now timbering the shaft on the property, which is down 75 ft., and it is the intention of the company to sink to 300 ft., and then cross-cut to the west, to cut the vein of the June Bug, from which Paul Barlock has been extracting some rich ore.——At Camp Dupont, Colo., D. H. Jackson has installed a whim on the Golden Terra and put on three shifts of men sinking the shaft, which is now 80 ft. deep. George Dupont has cut the vein in the breast of the 400-ft. cross-cut that he has been driving for the past few months. The ore in the vein at this point shows copper, gold, and silver, and the width of the vein is not yet determined.—— On the Copper & Iron claim, Scotty Price has struck ore at a depth of 28 ft., the bottom of the shaft showing values in gold and copper.—— A report is current that the Empire mine at Newberry mountain has changed ownership on a basis of 75c. per share for outstanding stock.——The Searchlight Co. has installed a new Dean duplex station-pump at the third level, of a capacity of 200 gal. per minute, and is sinking the shaft. The company has some ore on the third level, and now they are prepared to control the water; the lower levels will be opened as rapidly as the sinking will permit.

Searchlight, Jan. 26.

NYE COUNTY.

(Special Correspondence).—Activity in mining has been hampered during the past month by bad weather. The snowfall has been much heavier than usual, and travel by automobiles between Manhattan and Tonopah has been entirely suspended and freight traffic greatly retarded.—— Developments in the Mustang property are of interest. Work on this property was recently started by J. C. Humphrey, the present superintendent. The cross-cut on the 210-ft. level encountered a vein of quartz, showing gold and sulphides.——On the Chipmunk property, adjoining the Mustang, driving is progressing on a vein encountered by a cross-cut on the 100-ft. level. A hoist will arrive soon, and the shaft will be sunk.——Developments near Central continue. Among the active operators is the Monday Extension Co., which is driving on the 40-ft. level. Report has it that lessees are to work some surface-ores by rockers. The Ivanhoe property, including the Hooligan claims, is being developed on the 100-ft. level, and a hoist is soon to be erected.——The Consolidated is doing work on the Silver Pick claim. Timber for shaft-work is difficult to obtain, owing to freight congestion. Recent development in the lower workings shows no abnormal increase in water.—— Prospecting with drills similar to those used in the California oil-fields is to be tried on the Wolftone Extension. On the Joker ground a cross-cut adit is to be run to tap the vein opened on the hill-top near the Union No. 9.——Six miles south of Manhattan, the Willow Spring district is active. Low-grade veins of considerable size bear both gold and copper.——Superior, a copper camp 20 miles north of Manhattan, is expected to make a good showing as soon as the snow leaves, allowing prospecting to continue.

Manhattan, Jan. 30.

A new double-compartment shaft has been started on the West End property. Machinery is in place with a capacity of 1,000 ft. in depth.——The Tonopah Extension may be forced to close down on account of lack of fuel. The Golden Anchor, McKane, and Red Rock properties of the same company have all been closed down. Ore is being stoped on four levels of the Tonopah Extension, but car shipments to Salt Lake are greatly delayed. The company claims to have 25,000 tons of milling ore on the dump, and a mill of 300 tons daily capacity is contemplated.

BRITISH COLUMBIA.

The heavy snowstorms and prevailing cold weather has handicapped the railroads, with the result that there is still a fuel shortage at Rossland. The shipments of the last week in January from the Centre Star were 780 tons; Le Roi, 2,105 tons, and Le Roi No. 2, 415 tons. The Trail smelter received 3,477 tons from the Kootenay camps during the week.—— The Granby company has kept four furnaces in operation, while the British Columbia and Dominion Copper companies have run one furnace each.—— An electric transmission line has been run to the Brooklyn mine of the Dominion company, and a 50-h.p. electric pump will be operated there. The mine is closed down, owing to lack of fuel. The Rawhide is still running, but the shipments are light.—— Only 35 men are employed at the Snowshoe, which ships ore to the British Columbia Co.'s smelter, and to the Trail smelter.—— The Little Bertha mine, on the north fork of the Kettle river, has been taken over by a company, with a capital of $375,000.——The Riverside group of claims has been bonded to P. J. Dermody for $60,000, and work has started. The Fern mine has been bonded to a syndicate of Spokane men. The property is equipped with a 10-drill compressor, a 10-stamp mill, a gravity-tramway 2,300 ft. long, an electric plant, and other accessories. Much stoping has been done above the 300-ft. level.

It is stated that a smelter will be built at White Horse. A company has been formed for this purpose, with a $1,000,000 capitalization.—— Reports indicate activity in the Salmo mining district. The Nugget mine has 200 sacks ready for shipment, and recently shipped a car of high-grade ore.—— The Kootenay Belle is working 10 men, and has a good showing.—— The Queen property is producing, and the mill is running steadily. The Emerald company ships three cars per week of lead carbonate ore. A carload of ore from the Ore Hill was recently treated at the Hall Mines smelter.—— The consolidation of the British Columbia Copper Co. and the Dominion Copper Co. has been considered by the directorates of these two companies, and the idea of forming an amalgamated company has not been abandoned. If this amalgamation is consummated it will

Map of Part of British Columbia.

mean that the new company will be of gigantic proportions, as the combined capital of the two companies now is $7,000,000, the British Columbia Copper Co. now having a capitalization of $2,000,000, while the Dominion Copper Co. has a capital of $5,000,000.—— The St. Eugene mine at Moyie has been closed down for two weeks, as no fuel is to be had. Very few men are leaving the camp, but there are no immediate prospects of securing coal.—— It is reported that the British Columbia Copper Co. will declare a quarterly dividend of 50c. per share in February, which means a return of 40% per annum on the par value of the stock, or 16% on the market price.—— The Granby mines have resumed work after a five-day shut down, due to lack of fuel. The smelter has been blown in at about half its normal capacity. A. B. W. Hodges, the manager, states that four furnaces will be kept in blast, as 1,000 tons of coke have just been delivered. The latest official figures show that the Granby mines turned out 801,404 tons of ore during the past year, an increase of about 22% over 1905.

Personal.

CHARLES BUTTERS is at Copala, Mexico.

W. H. WEED has gone to Santo Domingo.

WILLIAM W. MEIN is on his way to London.

ARTHUR R. TOWNSEND is at Telluride, Colorado.

H. H. WEBB is on his way back to Johannesburg.

J. P. HUTCHINS is at Boschland in Dutch Guiana.

THOMAS J. BARBOUR has returned from New York.

WM. L. COBB is examining mines in Durango, Mexico.

W. MURDOCH WILEY has left New York for Guanajuato.

JOHN CAMPION, of Denver, visited San Francisco this week.

MARK R. LAMB has been on a visit to Guanajuato, Mexico.

FREDERIC J. SIEBERT has returned to Los Angeles from Arizona.

PATRICK HARRIGAN has received an appointment in Alaska.

ROBERT V. NORRIS has recently lectured on coal mining at Harvard University.

J. R. FINLAY passed through San Francisco on his way from Nevada to Spokane.

PELLEW HARVEY & FELL have removed their offices to 62 London Wall, London.

JOHN HOGAN is the new foreman of the North Star mine at Grass Valley, California.

ALVA ADAMS, twice Governor of Colorado and thrice elected, is visiting California.

H. P. ROBERTSON arrived from Australia on the *Sierra* and has gone to Mexico City.

F. L. BOSQUI has returned from Colorado. He has an office temporarily at Berkeley.

F. DIETZSCH has gone to Russia in the interest of the Siberian Proprietary Mines, Ltd.

H. C. BELLINGER is to take charge of a copper smelter to be erected at Greenwater, California.

R. S. BOTSFORD is on his way from London to the Argentine, to take an appointment there.

R. C. GEMMELL has returned to Salt Lake from an inspection of mines at Yerington, Nevada.

T. H. OXNAM is inspecting mines near Humboldt, Arizona; he will proceed shortly to New York.

G. A. DUNCAN, of Denver, is opening up some mines in Eldorado cañon, in Lincoln county, Nevada.

W. H. STORMS has resigned as superintendent of the Yellow Aster mine at Randsburg, California.

THOS. J. JONES, mining engineer to the Mountain Copper Co., has returned to Keswick after a short visit to the East.

BENJ. B. LAWRENCE has been erroneously reported as Western manager—instead of consulting engineer—for the Lanyon Zinc Company.

ABBOT A. HANKS will remove his offices and laboratory back to San Francisco in March. The new quarters will be at 425 Washington St., opposite the U. S. Custom House.

R. W. FOSTER, manager for the Sevier Con. Mining Co., operating near Kimberly, Utah, has resigned. He has accepted the position of engineer for the Union Pass Mining Co., near Kingman, Arizona.

ROBERT W. HUNT & Co. have been appointed consulting engineers to the receivers of the Union Traction Co., Chicago, and placed in direct charge of the lowering of the car tunnels under the Chicago river.

It is reported that M. J. DALY, assistant manager of the Silver King mine at Park City, will shortly be promoted to the position of general manager of the mining interests operated under the control of David Keith and Thomas Kearns. He will be succeeded at the Silver King by WILLIAM BLOOD.

Obituary.

GEORGE H. EVANS died at Berkeley on February 4. He was taken ill suddenly and an operation on the gall bladder resulted fatally. His death has caused wide-spread regret in San Francisco, where he had a large number of friends. Born at Hull in England, forty-two years ago, he was a mining engineer in active and successful practice. His specialty was placer mining. He came to California ten years ago to take charge of the operations on the Golden Feather channel, at Oroville, succeeding Col. Frank McLoughlin as manager. This position he occupied for three years and then he became manager of the Banner mine, also in Butte county. Subsequently he traveled widely, becoming consulting engineer of various alluvial enterprises in Colorado, California, and elsewhere. He was one of the consulting engineers associated with the Risdon Iron Works. As a member of several engineering societies and of the Bohemian Club, he had a wide acquaintance, among whom a kindly disposition and cultivated manner made him always welcome. The engineering profession has lost a worthy member.

Dividends.

On February 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 113 of $180,000. This makes the amount of dividends paid since January 1, $360,000, and total to date, $8,226,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, February 7.

Brunswick	$0.60	Argonaut	$4.75
Con. Virginia	0.88	Savage	0.86
Mexican	0.90	Sierra Nevada	0.52
Ophir	2.25	Yellow Jacket	0.93
Belmont	5.62	Montana	3.96
Jim Butler	1.17	Mohawk	17.00
Jumbo	3.80	Red Top	3.80
Jumping Jack	0.28	Sandstorm	0.72
Manhattan Con	0.89	Silver Pick	1.43
Midway	2.05	Tonopah Ex	5.00

METAL PRICES.

By wire from New York.

	Average prices for month of January.	Average prices for week ending February 7.
Copper—Lake (cents per lb)	24.825	25 @25¼
" Electrolytic "	24.404	24.70 @25
" Casting "	24.154	24.25 @24.50
Lead "	6	6
Spelter "	6.72½	6.70 @ 6.75
Silver (cents per oz.)	67.3	68¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	January 31. £ s. d.	February 7. £ s. d.
Camp Bird	1 8 6	1 7 6
El Oro	1 5 6	1 5 0
Esperanza	2 18 3	2 9 6
Dolores	1 11 3	1 11 6
Oroville Dredging	1 0 6	1 0 3
Stratton's Independence	0 3 3	0 3 0
Tomboy	2 3 0	2 4 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

Curb Quotations—New York.

	Closing Prices—Jan. 31.	Feb. 7.
Bingham Central	1¾	1½
Boston Copper	30	30½
Calumet & Arizona	184	193½
Cumberland Ely	12½	12
Dolores	7½	8¼
El Rayo	6½	6¼
Guanajuato Con	4¾	4¾
Giroux Con	9⅜	9¾
Greene Con	30¼	31½
Nevada Con	17½	17⅛
Nipissing	11⅞	7⅞
Tennessee Copper	47½	46¾
Tonopah Ex.	5¼	4⅞
Tonopah-Belmont	5¾	5¾
Tonopah	18¾	17¾
United Copper	..	71½
Utah Copper	38	36½

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Special Correspondence.

London.

New Flotations. — The Einasleigh Copper Mines. — The Anglo-Spanish Copper Co.—The Mount Cattlin.—Mineral Rights in Cornwall.—Large Capital to Be Invested.—Encouraging Outlook.—An American Syndicate in Cornwall.—Returns From Esperanza, Camp Bird, and Dolores.

Money being easier and January dividends being available, several new issues have made their appearance. The adoption of the old-fashioned prospectus would seem to prove that speculators' purse-strings are being loosened and that the public are again 'coming in.' Copper propositions predominate. One of the most promising of these is the New Einasleigh Copper Mines, Ltd., which has been formed, with a share capital of £200,000 to acquire a property in northern Queensland. The Queensland legislature has passed a bill authorizing the construction by the Chillagoe Company of a railway to the Etheridge goldfields that will pass within 12 miles of the mine. The property consists of 120 acres, and the purchase includes a lease of some 80 acres adjoining, which the company has the option of acquiring. The prospectus states that a main shaft has been sunk to 191 ft., and levels have been driven at 120 ft. and 170 ft. from the surface, proving in each instance the existence of an extensive body of copper ore. A blast-furnace of 50 tons capacity is on the property; but on the completion of the railway it will probably be more profitable to send the ore for treatment to the Chillagoe Company, with which negotiations are now in progress. It is said that the success of this flotation is already assured. With regard to the immediate prospects, it is reported that about 2,700 tons of ore averaging over 10% copper are lying at the mine and the ore proved about the 170-ft. level is estimated at over 36,000 tons of an average assay of about 10% copper. The ore carries an appreciable amount of silver and gold, which are collected in the matte.

The prospectus of the Anglo-Spanish Copper Co. is also advertised. The nominal capital of this company is £300,000, of which £110,000 is to be reserved for working capital. On the board of directors are found the names of Arthur C. Claudet and Andrew Johnson, late technical manager of Rio Tinto. The company acquires a lease in perpetuity of a valuable copper and sulphur property, situated in the province of Huelva, Spain, between the famous mines of Rio Tinto and Tharsis on one side, and San Domingo (Mason and Barry) on the other. The property consists of four groups of mines — the San Vincente, the Fronteriza, the Valrubio, La Carolina, and La Infanta, together comprising an area of about 444 acres, with an aggregate length of 5,100 metres, or over three miles along the line of lodes. Some £30,000 has already been expended in development on the San Vincente and Fronteriza mines, with satisfactory results, and in regard to these W. R. G. Rivington reports under date of October 2, 1906, that "5,000 tons of ore per month can be raised from the San Vincente mine within a short period of starting work. This tonnage, together with that raised from the Fronteriza mine, will enable 200 tons to be smelted daily, equal to 50,000 tons per annum, and will also, in addition, provide a further 100 tons of ore daily, making a total output of 80,000 tons for the first 12 months after commencement of operations."

Another copper mining company—Mount Cattlin—has just held its first stockholders' meeting. The chairman reported that the issue of the 200,000 shares of the company in November last was a satisfactory one, inasmuch as the whole amount was quickly over-subscribed, there being a number of applications from Western Australia—evidence of good opinion on the part of people who should be able to gauge the intrinsic value of the property. A cable from the consulting engineer, G. C. Klug, states: "Have located the three shoots of ore on the 200-ft. level. No. 1, 80 ft. long, 8 ft. wide. It contains 5% copper, 4 dwt. gold. No. 2, 80 ft. long, 6 ft. wide. It contains 3% copper, 2 dwt. gold. No. 3, 70 ft. long, 4 ft. 6 in. wide. It contains 2.5% copper, 2 dwt. gold. Preparations are being made to sink shaft; extending drift on the 200-ft. level, in order to develop country east and west. New air-compressors will be in full operation at the end of the month. Ore shipped to smelters to date, 1,264 tons, containing 67 tons copper, 261 oz. gold, 26 oz. silver. Gross value, £7,471; estimated net value, £3,808. 1,400 tons of ore on the dump ready and waiting shipment to smelting works. Selwyn Goldstein, late Great Boulder staff, has been appointed manager." Arrangements as to smelting have been made with the parent company, the Phillips River Gold & Copper Company.

The view expressed in my last week's correspondence as to the effect on the future of Cornish mining of the purchase by London financiers of the Tehidy 'lord's dues,' is receiving ample confirmation by local authorities. One of these, Mr. Herbert Thomas, is reported as saying that he thinks it is likely to be better, from the standpoint of the investing public, that the lord's dues should be held by business people who are heavily interested in Cornish mining ventures, than that they should be held by a private landowner, who has only invested a handful of money in the mines. Another statement (made in London), apparently from inspired sources, is to the effect that it is the intention of the newcomers to revolutionize mining in Cornwall, and their proceedings will be watched with extreme interest both inside and outside that county. One of their first steps will be to consign to the scrap heap some of the wretched stuff that in Cornwall goes by the name of 'machinery,' which is continually breaking down and costing in repairs more than it is worth. The newcomers will have no more corkscrew shafts, but will sink vertical shafts and drive direct to the lode. Great expense will be saved by such shafts in the items of hauling and pumping. They will also employ a far larger number of men than at present, and we believe they will get them if, as is stated, they are prepared to assure them regular employment and fair wages. The whole of the attention of the newcomers will not be concentrated upon the working of the mines, as the working of the market will also absorb some of their attention. There will be a rattling market for the shares, and encouraging reports will not be wanting. This is the sort of talk supposed to make Cousin Jacks sit up. Your correspondent can imagine some of them thinking, on contemplating such a glowing picture of what is to happen in the old county, that it may be less difficult to obtain "encouraging reports" than, at least in some cases, to "drive direct to the lode," even with the aid of vertical shafts and modern machinery.

The sale of his mineral rights by Mr. A. F. Bassett is still the subject of much comment and curiosity in western Cornwall. At an interview with a press representative, E. W. Meyerstein, of the firm that has acquired these rights, is reported as saying that the fault in the present working of many tin and copper mines in Cornwall was that the work was done on too small a scale. There was also a lack of modern machinery, some of the plant in use being from fifty to a hundred years old. With such antiquated plant the profits of the industry were so small that nothing was left for the landlord, who was entitled to dues upon the quantity of mineral sold.

In these circumstances the landlord would not allow the mines to be worked at all, if it were not that pumping operations were necessary. If one shaft was allowed to fill, the water would spread from one mine to another. Thus it paid the landlord better to let the mines be worked, even though he derived no cash benefit from them, than to permit them to remain idle. A company with a large capital would be formed by the new landlords, who would act in a sense as financiers to the various mines. The combined concern would represent the whole of the mineral rights on some of the most famous Cornish mines, including the Wheal Basset, Carn Brea, East Pool, a part of South Crofty, and the various streams in the Red river. Some of these concerns had paid no dues to the landlords for years, but the company to be formed would occupy a very different position from that of the landlords. For instance, any one of the companies might say that it was not in a position to pay its dues. The answer of the big company would be: "Very well; reconstruct your company, and we will, on terms, give you the financial aid you need in the way of adequate working capital." He cited the case of the South Wheal Crofty, in which his firm took an active interest. That mine was recently removed from the old 'cost-book' system of working, and was taken under the Limited Liability Acts.

The capital of the new company was £50,000. The machinery to be put into the mine involved an outlay of some £25,000, but the immediate result was that the company was able at once to step into a position of prosperity. The dividend for this year would be no less than 50% and for the following year 100%. The landlord thus came in for the dues which had been so long in abeyance. It was the success of this operation that paved the way for the more comprehensive scheme which was now being carried out. It is considered pretty certain that the new landlords will insist upon drastic changes at Carn Brea, and the public is prepared for an announcement in regard to East Pool. Several abandoned setts on the Tehidy estate will, it is thought, be taken in hand by the owners. Meanwhile a correspondent anxious about the labor question, sees in the royalty purchase an indication of a bright future for Cornish mining, but he points out that the labor question will become more and more difficult with the expansion of the industry, and contends that the mine-owners will best serve their interests by securing the services of Cornish miners for Cornish mines. He says: "There are hundreds out of work in the Transvaal who have no money to come home, the mail-boats being too expensive. I suggest that it would pay the syndicate that has purchased the Tehidy royalties to charter an emigrant ship to bring them home and give them work. A proportion of the men's wages could be kept back monthly until their passage money was paid." Meantime, while the local mines are advertising for men, miners continue to leave the country for foreign parts. R. Arthur Thomas, who presided at the first ticketing of the year, found several strangers in attendance, it is said, one of whom was a New York pressman engaged in writing up the boom! The quantity of black tin sold was 235½ tons realizing £25,998 at an average price of £110 10s. 3d. Anent the New York influence, it is announced that an American syndicate is buying up tin mines in Cornwall, and intends to spend £1,000,000 in their development. Among the mines acquired are said to be Balswidden and Consols, in the Wendron district, and Wheal, Speedwell, Rodney, Crabb, and the Virgin group in the Marazion neighborhood. In addition it is intended, if possible, to gain possession of several mines in the Camborne and St. Just districts. The name of the syndicate has not been published, but its agent, Edward Melville, has for some time been staying at Penzance, conducting negotiations. There is also some tall talk from the same source about the erection of tin smelting works near Marazion. An event of some importance may be noted in another part of the county—the ordering of an Elmore vacuum oil plant by the Clitters United capable of treating about 30 tons per day of pyritic copper-tin ore.

The Siberian department of the mining market has become somewhat steadier since the return of Mr. Orkin from St. Petersburg. The 'titles' scare, so effectively worked by the 'bears,' appears to have exhausted its force. On the other hand, it cannot be said that the news regarding the gold-mining results of the Orkin group is of such a character as to warrant even the present quotations of the operating mines.

Some of the American-managed mines on the London market continue to send reports calculated to maintain the interest of the speculating public. The December return of Esperanza (Mexico) shows that the mill ran 29 days and crushed 12,598 tons of dry ore; shipped to smelter, 4,338 tons of dry ore; estimated value of bullion produced, $145,186; value of concentrate, $74,609; value of ore shipped to smelter, $274,682; receipts from rents and other sources, $548; total, $495,125. The deduction of usual working and other expenses leaves a profit at the mine of $270,939. Shipping ore on hand, 529 tons. The manager reports that the amount of ore sent to the smelters is below the average, owing to the shortage of railway cars. He further reports that "development on the north end of the 5th, 6th intermediate, and 6th levels, on the West veins, is looking very well indeed, and in the northern portion of the mine the development of the San Rafael vein is showing up considerably more oxidized ore than was expected." In 1906 the total profit was £937,933; dividends amounted to £705,250. Thus, after paying dividends amounting to 31s. per £1 share, there is sufficient cash in hand to pay a further dividend of 10s. per share, with a substantial balance to carry forward. At the Camp Bird (Colorado), the mill ran 28 days in December and crushed 6,676 tons of ore, yielding 15,333 oz. bullion and approximately 651 tons of concentrate. Amounts received from sales of bullion effected during the month (including cyanide bullion), $238,216; concentrate (581 tons), $33,322; total revenue, $271,568; usual expenses, $55,664; surplus profit at the mine, $215,901. Feet of development work, 315.

Camp Birds were in demand on the market on the publication of the above-mentioned record return for December. In this connection the public has been reminded that the chairman, at the meeting held on September 7 last, announced that on the resumption of milling, high-grade ore would be put through the mill, thereby making larger profits than the average, so as to re-adjust the financial position as soon as possible. He cautioned his audience that such returns would be abnormal, and must not be regarded as average results. Following precedent, the news from Dolores (Mexico) is of less recent date. The returns for November are announced: Tons of ore treated, from the mine, 267; from tailing, 379; for cyaniding, 563. Total value of the production, $53,000; expenses, $23,000; profit, $30,000. From a review of the general situation at the mine, taken from the report of the new manager, W. H. Paul, dated December 6, it appears that the fourth (bottom) level was advanced in November 31 ft., and it looks as if it would be but a short time before the ore-shoot from above is cut. The manager thinks the third level is in the centre of the broken zone that showed for over 200 ft. on the main tunnel-level above. To remedy the recurrent difficulty as regards shortage of wood for fuel,

the manager suggests the possibility of water-power for the mill. He states there is a fall of 500 ft. vertical at the back of the mill, and that with the necessary plant, he believes there would be sufficient water-power to drive the mill for eight months in the year, if not longer. Apart from a shutdown of four days from lack of wood, everything has been running smoothly at the mill. Various improvements are in hand. Nearly all the concentrators had arrived and the remainder were due in about a fortnight. The additional tube-mill was ready at the makers and would be forwarded at once. The sand-plant had been put in commission, and the manager was considering the question of the most suitable place in which to install the Butters filters when they arrive.

Butte, Montana.

Bad Weather Impedes Operations.—Lessened Output.—No Copper in Storage.—Boston & Montana.—Butte & London.—Two Re-organizations of Doubtful Status.—Barnes-King Development Co.—Vigorous Exploratory Work.

Zero weather for nearly three weeks, a coal famine, and inability to get railroad cars caused a reduction of more than 6,000,000 lb. in the copper production of the Butte district in January. The total production was but 21,337,176, as against 27,491,420 lb. in December. Many of the mines had to suspend for several days at a time and three or four times during the month. The extreme cold weather froze the ore in the bins and on the cars so

that they could not be unloaded, and the long continuing storms blockaded traffic on the railroads so that nearly all the mines and smelters ran out of fuel.

The ore tonnage and copper production for the month was as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	71,300	5,418,800
Anaconda	78,182	5,707,286
Butte & Boston	12,865	900,550
Washoe	11,501	865,070
Parrot	7,006	420,360
Trenton	14,291	928,915
North Butte	30,690	3,069,000
Coalition	24,800	1,785,600
Original	17,050	1,023,000
East Butte	3,782	340,380
Pittsburgh & Montana	4,030	314,340
La France	5,425	406,875
Miscellaneous	3,100	217,000
Total	294,022	21,337,176

The protest telegraphed to Attorney General Bonaparte by James Norton of New York against an alleged effort of a copper trust to run up copper prices by storing the red metal in various parts of the country, was not based on facts as far as Butte is concerned. He said 9,000 tons of copper were stored in Butte. At the time the statement was telegraphed there were not 400 tons of copper in the whole State of Montana. That fact was ascertained by careful investigation. It has been a fact well known in Butte, Anaconda, and Great Falls, where the big smelters are situated, that for a year copper has been loaded on cars and shipped before it had time to cool, and for more than a year there has never been on hand at any smelter in Montana more than one day's production. Daily shipments have been made when cars were available. During the severe cold weather in January and December, and the consequent car-shortage and tie-up of traffic on the railroads, the accumulation sometimes was of several days' production; but, aside from that, there was no copper on hand anywhere. If Mr. Norton's statement concerning other localities was as erroneous as it was about Butte, he will have some difficulty in furnishing the proofs which he promised the Attorney General.

Since the improvement in the weather the Boston & Montana Co. has resumed sinking in several of its large shafts. The Leonard shaft, a large four-compartment affair, is 1,260 ft. deep, and will be sunk to a depth of 1,400 ft. The big shaft on the West Colusa has reached a depth of 1,700 ft., where a station is being cut. It will be completed in a few days, when sinking will be resumed and the shaft carried to a depth of 2,000 ft. At that point the immense vein opened at the 1,600 will be crosscut and developed. The Colusa vein is 150 ft. wide and it is estimated that when thoroughly opened on the 2,000 there will be enough stoping ground to last the company for 10 years, and that the mine will be capable of yielding 1,000 tons of ore per day. All of the mines of the Boston & Montana have been yielding the usual quantity of ore since the cessation of the extreme cold weather which continued almost uninterruptedly for four weeks during December and January.

The head-frame of the Butte & London and the station at the 800-ft. point have been completed. This station is to accommodate the big pump, which occupies a floor-space of 13 by 48 ft. The present flow of water is not great, but an increased flow is expected with every vein that is cut. Report has it that the vein cut by the shaft between the 600 and 700-ft. points contains much better ore than was admitted by those in charge, and color is given to this by the fact that some of the miners familiar with the ground have been trying to secure a lease to work the vein, and the company has refused to lease on any terms.

A number of New York stockholders of the Butte & New York Copper Co. have been in Butte the past week inspecting the company's properties and the progress of the development work being done. The Butte & New York Co. was organized on a majority of the stock of the Butte-Milwaukee Co. and has assumed control of the property of the latter company. It is understood to be a re-organization of the Butte-Milwaukee Co., although the minority stockholders of the latter were not notified or consulted. The company owns the Pollock, a developed silver property; the Colonel Sellers, upon which the new company is sinking a deep shaft; the Bird, and an option on another claim known as the Narrow Gauge. Some of the New York men interested in the re-organization of the Butte-Milwaukee are interested in a similar re-organization of the Butte Copper Co., under the name of the Butte Copper Montana Co., the latter having recently been organized on a controlling interest in the Butte Copper Co. The minority shareholders of the latter company were given no chance to participate, and their status under the new company has not yet been explained to their satisfaction.

R. B. Lamb, general manager and consulting engineer for the new Barnes-King Development Co., has completed his working force for the mines, and it includes some of the most experienced gold miners in the West. Mr. Lamb, after a thorough examination of the mines, is satisfied that they can be made to yield 500 tons of ore per day. Special importance is attached to workings on the north end of the property, known as the Horse Shoe mine. More than 700 ft. of development work is under way there, and it is all practically virgin ground. From the main level a winze is going down in splendid ore, the body being regular and solid. Development is also in progress north and south on this level, and it is planned to erect an electric hoisting plant in a short time to hoist from below the 700-ft. level. A short distance from the Horse Shoe is the Mule Shoe mine, and another body of ore is being developed there. Stoping is going on from this point and the ore is shipped to the mill. Below the two mines mentioned a small silver vein is being developed. It carries close to $100 per ton, the ore being sacked. Above the silver vein an adit is being run, and $8 per ton ore has been encountered there. In the south end of the property the main development work is being done, and some good ore has been opened, but it will be necessary to go farther before the main orebody is cut. To handle the ore properly and economically from these workings, a new shaft will be sunk and deeper levels run. In the Santiago, which is situated still farther down the mountain, the orebody is proving to be all that was anticipated.

Salt Lake, Utah.

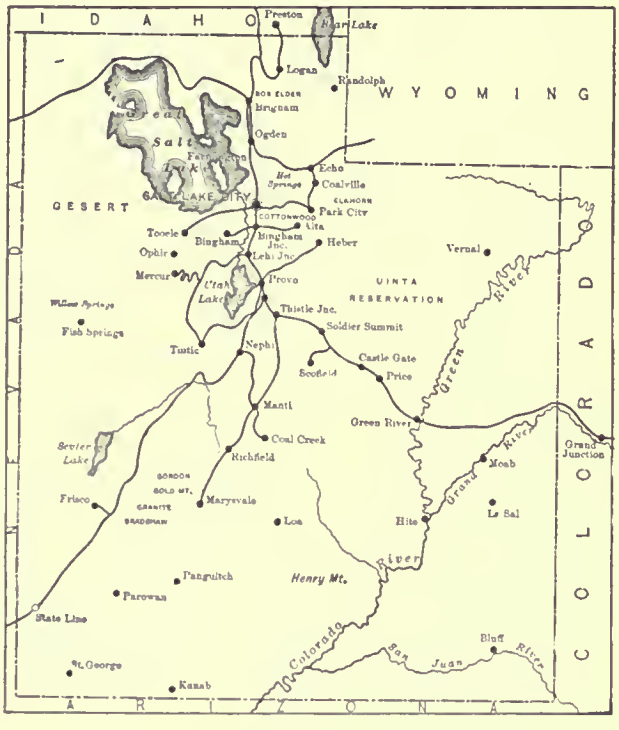
Dividends.—Shipments from Tintic.—The Grand Central-Mammoth Suit.—Good News from the Ajax.—Activity in Beaver County. Transportation Facilities Needed for Bingham.—Mercur Mill at Work Again.

Ten Utah mines paid dividends during January, the total distributions amounting to $1,193,000, as follows: Daly Judge, $112,500; Silver King, $50,000; Columbus Consolidated, $42,500; Yankee Consolidated, $15,000; Beck Tunnel Consolidated, $40,000; Grand Central, $15,000; Victoria, $10,000; Utah Mine, $3,000; Utah Consolidated, $900,000; Century, $5,000.

Nineteen mines in the Tintic district sent ore to the smelters during the past week, the total was 156 carloads, distributed thus: Ajax, 3; Beck Tunnel, 14; Bullion Beck, 8; Carisa, 3; Centennial Eureka, 53; Eagle & Blue Bell, 9; Eureka Hill, 6; Gemini, 10; Grand Central, 3; Ladede, 1; Mammoth, 12; May Day, 2; Scranton, 6; South Swansea, 1; Tintic Iron, 10; Uncle Sam Con., 2; Victoria, 5; Yankee Con., 6 carloads.——Another chapter has been closed in the now famous Mammoth-Grand Central suit, which has been pending in the courts for several years. The Grand Central brought an action against the Mammoth for title to certain mining claims and $300,000 damages for the value of ore alleged to have been unlawfully extracted therefrom. The case was decided in favor of the Grand Central in the State courts, whereupon the Mammoth company endeavored to carry it to the Federal Court on the ground that the Grand Central was a foreign corporation; but the application has been denied.——The installation of two electric hoists at the Lower Mammoth will be completed during the present week when the company will produce at the rate of 100 tons of ore daily.

Some interesting developments have been reported as having occurred on the 1,000-ft. level of the Ajax mine. ——An official of the Tintic Smelting Co. has made the statement that the breaking of ground for the proposed lead smelter, to be erected this year near Silver City, will begin some time in March. Water to be used for smelter purposes will be pumped from the Swansea mine.

The coal famine having come to an end, the management of the Cactus, in Beaver county, has resumed milling operations, after having experienced much annoyance. The plant is equipped to treat 1,200 tons of ore per day, and, if all goes well, the company should make money rapidly. The management of the Indian Queen mine, situated near the Cactus, has reported that two drifts from the main tunnel are showing shipping ore. L. N. Morrison of Salt Lake is manager.——The minority shareholders of the Blackbird Gold & Copper Co., which



Utah.

owns a large area of mining ground adjoining the Cactus mine, have brought suit to enjoin the company from selling the remaining bonds (amounting to $156,700) for ten cents on the dollar, to the president of the corporation, together with a stock bonus. At the late shareholders' meeting John E. DuBois was elected president.

The new tramway of the Utah Apex Mining Co. at Bingham is in operation after several weeks of vexatious delay. It is the intention of the company to increase ore shipments at once.——Suit has been instituted in the Federal Court against the Columbus Consolidated Mining Co., operating at Alta, the Government being the plaintiff. It is alleged that the mining company is occupying a portion of the public domain without proper authority. A restraining order is asked for, also judgment for $1,000 damages.

The matter of ore transportation from Bingham to the smelters is still a matter of anxiety to operators, notwithstanding the recent completion of the Rio Grande Western Co.'s second line into the camp. Without better motive-power equipment the railroad management will not be able to handle the traffic coming to it from the mines. The first unit of the Utah Copper Co.'s new mill will be ready for operation next month, but it is doubtful if the present transportation facilities will be adequate to keep it supplied. The announcement that the directors had decided to call a special meeting of shareholders to authorize an increase in the capital stock of the company 60,000 shares, the same to be alloted among present shareholders at $25 per share, came as a surprise. Additional funds are needed to complete the mill and power-plant.

Toronto, Canada.

Shipments From Cobalt.—Explorations in the Nipissing.—Other Exploratory Work in Progress.—Pyrites Deposits.—The Ontario Legislature.—Confusion in Names.

Reports of the shipments of Cobalt ore over the Temiskaming & Northern Ontario Railway will henceforth be made weekly. The shipments for the week ended January 19 amounted to 334 tons, by the following companies: Nipissing, 118 tons; Buffalo, 70; O'Brien, 62; La Rose, 61; Foster, 22 tons.——Testing by diamond-drill at La Rose mine to a depth of 383 ft., has established the fact that there is rich ore at that depth. It has therefore been determined to sink the shaft to the 400-ft. level and drive on the vein. Samuel Newhouse, W. R. Thompson, and other directors of the Nipissing will inspect the company's mine this week. The policy of the newly constituted board as outlined by Mr. Newhouse involves a systematic course of development and the installation of more machinery. It embraces the driving of at least three different main shafts with a complete cross-cut exploration to tap the large number of rich veins crossing the property.——The new machinery of the Erie mine is now being installed and a force of 58 men is at work.—— About 6,000 ft. of trenching has been done, and eight well-defined veins have been uncovered.—— At the Green-Meehan mine, 73 men are at work. A 40-ft. foundation is being prepared for the new boiler-house, in which two 100-h.p. boilers will be installed to supply power for the drills and hoists. Mining is being actively carried on along No. 1 vein, which has been opened for 315 ft. Veins No. 8 and 9 have been open-cut for about 40 ft. These workings are being covered, so that the weather will not interfere with operations.——A stamp-mill and concentration plant are being installed at the mines of the Cobalt Central Mines Co., where work has hitherto been done by pick and shovel, and the ore shipped in bulk; another big strike is reported at the Big Pete, owned by this company, at the 58-ft. level, where a blind vein has been exposed carrying 11,000 oz. silver per ton.——Contracts have been let for the sinking of shafts on the properties of the Coleman Development Co., on which three promising veins have been uncovered. Superintendent Leyson, of the Silver Queen, reports that a 7-in. vein of good ore has been struck on the 125-ft. level.——A large force of men is at work on four locations belonging to the Cobalt Union Mines Co., about five miles west of Cobalt, for the development of which comprehensive plans have been adopted.

The Northern Pyrites Co. has acquired possession of a valuable sulphide property lying north of Dinorwic on the shores of Vermilion lake in northwestern Ontario. Complete arrangements have been made for the development of the property for the supply of the New York market. E. R. Michie, the general manager, was in Dinorwic last week, arranging for the freighting to the mine of a large plant including two 65-h.p. boilers, a 12-drill Duplex compressor, and a saw-mill and machine-shop outfit. A spur line of about five miles will connect the property with the Grand Trunk Pacific Railway.

The Ontario Legislature was opened on January 24. The address of the Lieut.-Governor, outlining the legislation proposed by the Government, stated that a measure providing for the taxation of mining properties would be submitted. It also contained a warning against "hasty and reckless investment and speculation"—which will no doubt be universally approved and generally disregarded.——In consequence of the numerous complaints of the confusion caused by the similarity of the names of many Cobalt mining companies, the Provincial Secretary has ordered that the Lawson Cobalt Silver Mining Co. and the Kerr Lake Lawson Mining Co. shall each adopt a new name.

Labor is inferior at Cobalt, but wages are good. Pick-and-shovel work is paid for at the rate of $2 and board, miners get $2.50, and machine-men $3, with board. Board costs about $4.50 per week. Sinking is done by contract, prices averaging from $18 to $35 per foot according to the depth. After 40 ft. the windlass is removed and a steam-hoist (costing $750) is employed. A steam-drill is often added, at a further cost of $250. Only a few contracts have been made for over 40 ft., at which depth a shaft must be timbered.

The latest strike of rich ore is in the Temiskaming in Lot I Concession III Coleman, a portion of the district which up to a week or two ago was not considered very important. Such rich bodies of ore are coming to light in different portions of Coleman, Bucke, and Lorrain, wholly disproving the early theories and extending the silver-bearing area to approximately 50 miles square, leaving, of course, many undeveloped square miles in between. The Larder Lake excitement bids fair to be a permanent gold camp. The Temiskaming & Northern Ontario Railway is considering a line from Englehardt to Larder Lake, and the spring will bring a rush of gold-seekers to the region. While every one is intent on finding quartz veins, the alluvial is being overlooked.

Leadville, Colorado.

Homer Shaft to Be Sunk.— Extension of Ore Measure.— Important Development on Breece Hill.— Horseshoe District.— Mammoth Placer to Resume.

During the fall of 1906, developments in the Coronado workings proved that the great ore-shoots of this property dipped rapidly toward the west, and in consequence the theory of the late Henry Higgins has again come into prominence. Mr. Higgins attempted to put his theory into practice by sinking the Homer shaft about a mile and a half west of the city, but water put an end to the project. Recently local capitalists have completed arrangements to sink this shaft to the first contact. It is estimated that $200,000 will be required to buy the necessary equipment and sink the desired depth. The machinery will include a pumping plant larger than any of similar character now in operation in the district, and the development work contemplated by the new company will probably settle the long mooted question of ore-shoots west of the city.

More than twenty years ago a shaft was sunk on the Jaybird property, near the head of California gulch, to a depth of 185 ft., and abandoned, as no pay-ore was discovered. Recently Dr. J. J. Cook, the owner, granted a long lease to A. Sandusky and F. Bochatey, who continued the shaft but a few feet when a body of sulphide ore was discovered, carrying high values in gold, silver, and copper, and approximately 24% zinc. A shipment is now being made as a check on the assays obtained from smaller lots.—— Not since the discoveries in the Little Johnny and Printer Boy properties has so much interest been aroused in the Breece Hill district as has resulted from the late discoveries made in the President. The properties lying in Big Evans gulch on the trend of the new shoot are making active preparations to sink to the contact that carries this shoot. The ore resembles that from the Little Johnny in character, and the direction of the shoot leads many mining men to conclude that it is an extension of it; therefore, the strike is being watched with unusual interest.

The Mount Harvard claim, which for the past twelve years has been undergoing development, has at last entered the list of producers. The owner cut a four-foot

vein of unusual richness, and of good size, as indicated by the work done in the past two months.—— Reports from the Horseshoe district indicate a lively campaign just across the Mosquito range from the head of Iowa gulch. The lessees of the Clover group report a 14-ft. vein of quartz running well in both gold and silver; also the Madsill, under lease to W. H. Powless, has opened up a large shoot of good mill-ore.

The important announcement has been made that the Mammoth placer in Big Evans gulch will soon resume operations; in fact, work is now well under way under the direction of the manager of the new company, J. A. Murray. It will be remembered that last year a shaft was sunk that opened up an unusually rich orebody, but the lessees forfeited their lease by not being able to cope with the large body of water. The new company is styled the Leadville-Wellington Bonanza Mining Co., and is composed of Boulder county capitalists. Excavation has been started for a large power-plant, a 10-in. water-column is being installed, and electric turbines will be employed to generate the power. The resumption of work on the Mammoth means a great deal to Leadville, since the known body of high-grade ore, which was explored by Major Bohn for the old company, proves the extension of the Breece Hill ore-shoots in this direction, and means a much larger area to be included within the Leadville gold belt. —— A strong company has been organized to develop the Arizona placer, embracing 160 acres, and located on Empire hill, eight miles from Leadville. The work of cleaning out the old workings, which were abandoned 28 years ago, has begun. The main shaft was sunk but a few feet when a strong shoot of carbonate ore, running 65 oz. in silver, was uncovered.

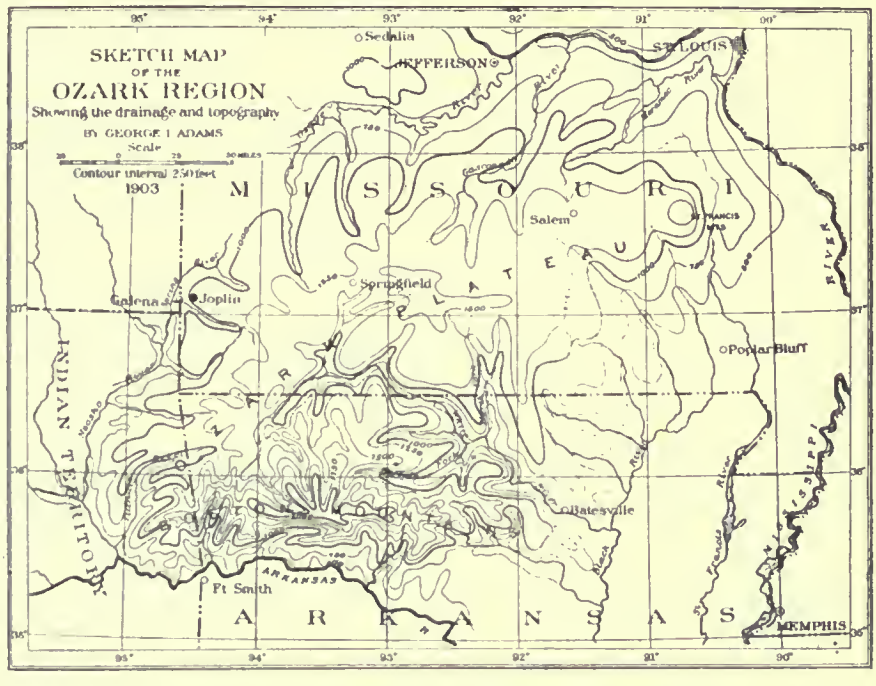
Joplin, Missouri.

High Prices for Zinc and Lead Ore.—Shipments for the Week.—Several New Strikes.—Activity in Prospecting.—New Companies Organized.

The highest price reported paid for zinc ore last week was $51 per ton for the ore from the Greencastle mine on the land of the Rex Mining & Smelting Co. and the ore from the Temagami on the land of the Continental Zinc Co. It was reported that $52.50 was paid for some ore from the Missouri Lead & Zinc Co.'s land, but the report could not be verified. Lead ore continues to hold strong, advancing a little every week, $88.50 having been paid last week and with each week the prospects for $100 lead grows more encouraging to producers. Last week the Galena Smelting Co. of Galena, Kansas, sold their smelter to the Hammar Bros. White Lead Co. of St. Louis, which may be an advantage to the lead producers and help raise the price. This smelter has been closed down for the past several months but the new owners will re-start the plant as soon as arrangements can be made to do so.

The shipments last week were: Zinc ore, 11,201,360 lb., valued at 258,213; lead ore, 1,539,330 lb ,, valued at $65,437; combined value $323,' 50. Compared with the previous week it was an increase of 1,838,940 lb. zinc ore and a decrease of 38,390 lb. lead ore, and an increase in value of $12,652. It was also an increase in value over the same week of 1906 of $70,510. The total January sales of 1907 mark an increase of 757,050 lb. zinc ore and 655,150 lb. lead ore, and in value $74,253, over the January sales of 1906.

The Old Times Lead & Zinc Co. of Joplin has purchased the lease on the Superior mine and mill on the Leonard Realty Co.'s land at Chitwood, which has been owned by Eastern capitalists. There is only one shaft at present connected with the mill but it is understood that the capacity of the mill will be doubled and tramways constructed connecting it with two or three other shafts in which pay-ore has been found, and in this way keep the mill in steady operation.——The Ishpeming Mining Co., operating at Sherwood, has made a new strike of zinc ore and now has a 16-ft. face from which to work on.——The Alpha Mining Co. operating at Spurgeon, south of Joplin, has been making a splendid showing for several months.



Map Showing Position of the Joplin District.

Activity in prospecting mineral lands southwest of Jasper is being resumed. Coal is being hauled to the Schmuck land, where some prospecting was done and some free ore encountered in a shaft that was sunk to a considerable depth. Preparations are also being made to resume work on the Rice land in the same vicinity where prospect work was done with some promise of success.—— A new shaft at the American Beauty mine on the Underwriters Land Co.'s land north of Webb City is now down to 110 ft., which is within 10 ft. of the orebody as shown by the present hoisting shaft.——The Black Cat mine, on the Guinn land north of Webb City, has temporarily shut down for the purpose of making some needed repairs to the mill and while this is being done development work will be pushed.

The Last Chance Mining Co. composed of Otto Gosch, W. S. Marquiss, and Roy Hilburn of Webb City, operating on a lease on the Chinn land at Prosperity, has made a rich strike of lead ore by drill. They have penetrated 22 ft. of ore. This lease is located just east of the General Lead & Zinc Co.'s lease, one of the best leases in the entire district. A shaft will be started at once and if the property proves as good as the drill-cuttings a mill will be erected in the near future.——The S. W. Prospecting Co. of Joplin has filed articles of association with a capital stock of $30,000. The same parties have organized the L. W. Mining Co. with a capital stock of $50,000. Sidney L. Wilkins, W. S. Bartlett, and J. W. Perry all of Joplin are the stockholders.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE specific gravity of a substance is its weight as compared to the weight of an equal body of pure water.

THE celebrated metric bar serving as an international measure, preserved at Paris, is of platinum, with 10% alloy of iridium.

In using hemp ropes, the bowline is one of the most useful knots, as it will not slip, and it is easily untied after being strained.

IN corrugated iron, both for roofing and siding, corrugations 2½ in. wide by ½ or ⅝ in. deep are recognized generally as the standard size.

AN easy rule-of-thumb to remember in estimating the weight of material, is that a sheet of iron one foot square and one inch thick weighs 40 pounds.

THE stamp-cam curve is an involute of a circle, the radius of which is equal to the distance between the stamp-stem and the cam-shaft, centre to centre.

AN act of the Congress passed in 1893 established a standard gauge for sheet iron and steel, which is based on the fact that a cubic foot of iron weighs 480 pounds.

EVERY triangle has six parts—three angles and three sides. When any three of these parts are given, provided one of them is a side, the other parts may be determined.

THE weight of common loam, shaken, is from 82 to 92 lb. per cu. ft.; that of dry gravel or sand, 90 to 106; and that of sand, perfectly wet, 118 to 129 pounds per cubic foot.

ONE square of roof, means 100 sq. ft. of surface. Using pine shingles, if four inches is exposed to weather, 900 shingles will be required, weighing 216 pounds; while if six inches is exposed, only 600 shingles will be required, weighing 144 pounds.

IN English practice, cable-traction ropes are commonly made with six strands of 7 or 15 wires, while in the United States, strands of 19 wires are generally preferred as being more flexible. Much of our hoisting rope is made on the latter plan.

PLOUGH-STEEL ropes are made from a very high grade of crucible steel, having a tensile strength of from 100 to 150 tons per square inch. This rope is used for long ropes where the reduction of the dead weight of the rope becomes a matter of serious consideration.

COBALT, in the form of smaltite, is being obtained at the Standard mine, in Grant county, Oregon. A concentrate containing 15% cobalt and 10 oz. gold is obtained, but in small quantities. The ore affords an interesting problem in concentration, as it contains native gold, smaltite, and chalcopyrite.

IN spite of the apparent inaccuracies of the method, the crucible assay continues to be used almost entirely in the determination of lead. Most of the smelters buy on the basis of crucible-assay returns, and the wet method, although far more reliable, is seldom seen in use in the field.

A FEW YEARS AGO it was predicted that a high price for copper would bring aluminum or an aluminum-copper alloy into successful competition with copper, in the manufacture of the wire used in transmitting electric power. This has proved a delusion. The output of aluminum is too restricted to enable it to replace copper, the demand for which has overtaken the supply.

MOUNT BISCHOFF tin mine, in Tasmania, has returned £2,079,000 to its shareholders. The discovery was made by James Smith in December, 1871. In 1873 the present company was formed with a capital of £60,000, of which only £29,000 was called up. In February, 1877, the first dividend was paid and since then the profits have been distributed each month with marvelous regularity. At present the average ore yields 2.75% tin.

A METHOD in use in diamond-drilling in the copper district of Michigan, for determining the dip of the drill at the bottom of the hole, consists in lowering a glass tube partly filled with hydrofluoric acid. A duplicate tube, similarly filled, is kept at the surface, and when the acid has etched a well defined line marking the angle at which the surface of the liquid rests, the tube is withdrawn from the hole, and the dip read directly, by means of a protractor.

IN reply to the question as to who has the best right to the mining claim, wherein *A*, in January, 1905, locates the claim and has the location work done, but does not record it with the district mining recorder (though but a short distance away); and then near the latter part of 1906 he (*A*) arranges with a contractor to excavate about 280 cu. ft. of work on the claim (where it was all easy picking and shoveling ground, and where he would not need to blast) for $100; and the contractor commences work there on the last day of 1906 and quits on January 3, 1907, and moves off the claim January 4, 1907, taking away all of his tools, claiming that he had performed his contract and was done with it. As this work did not quite fill his contract as to the number of cubic feet, and could have been done by a first-class worker in less than two days' work of eight hours each, then comes *B*, after the contractor had moved away, and locates the claim on January 4, 1907, claiming that but a very small part of the annual assessment work was done for 1906. Which has the better right to the claim? The contractor had to come 60 miles to do the work, and return home when it was done, and he only did from two to three days' work on the claim for his $100, which it was agreed should be paid him for a certain amount of cubic feet excavated in loose or picking ground.

The facts recited in this communication do not present a question upon which the MINING AND SCIENTIFIC PRESS should venture an opinion except in so far as it might possibly involve the application of general principles of mining law, and we shall content ourselves with a simple statement of these principles: The value of assessment work is not to be determined necessarily by the contract price or the amount paid. These may be elements entitled to consideration, but are not necessarily controlling. The question simply is: What is the reasonable value of the work done, considering the local environment? The remoteness of the claim and the time and expense necessarily involved in reaching it, where the camp is inactive and labor is not obtainable, may under certain conditions be considered in estimating the value of the work. A mere expenditure is not sufficient. The work must tend to develop the claim and be of the reasonable value claimed. The burden of proof to establish non-performance of the work rests on the party asserting forfeiture. Where there has been work done and done manifestly in good faith, judicial sympathy rests with the original discoverer as against the 'jumper.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Treatment of Slime.

The Editor:

Sir—The attack upon the slime-treatment problem seems of late to have been worldwide and during the year 1906 crowned with a large measure of success, through the various devices for vacuum-filtering brought out up to that time.

Having been greatly interested in the matter bearing on the subject, published in your journal since Mr. R. Gilman Brown's paper in the issues of September 8 and 15 last, and having had somewhat of a struggle with the same problem a few years ago, which resulted in the design of a horizontal revolving filter continuous in its operation, I venture to step across the somewhat indefinite boundary dividing the domains of the mining and civil engineer, not however without some trepidation engendered by the oft repeated question, "Who is a mining engineer?"

The design referred to was made for a company that became financially embarrassed, and during a long period of re-organization the mill was shut down and the filter not installed. Pressing calls on my time in other directions have prevented systematic efforts for its introduction in other localities, hence it lacks the interest derived from actual operation under working conditions.

In general, it consisted of a shallow tank carrying a filter of canvas and cocoa-matting resting on perforated boards a few inches above the bottom of the tank, which is attached to a cast-iron hub revolving around a fixed hollow central pedestal. The weight at the centre is supported upon ball bearings, and at the periphery upon wheels running on a circular track. The space between the filter and the bottom of the tank is divided into a number of compartments by radial partitions, air-tight with respect to each other.

A portion of the hollow pedestal is connected by a pipe, through the bottom, with a vacuum-pump and forms the vacuum-chamber communicating, through openings in the hub, with the compartments beneath the filter. In the vacuum-chamber there is a valve-box and valve arranged to automatically cut out each compartment successively from the vacuum and admit to it compressed air to loosen the cake and aid in keeping the filter open. The cake is removed mechanically over a scraper at the end of each revolution and the cleaned surface of one sector presented again for the onflowing pulp. The canvas surface of the filter is protected from damage by the scraper by being covered with coarsely perforated steel or thin steel strips. The top surface of the filter is plane, without projections to interfere with the operation of the scraper. To prevent the flooding of the whole filter, light radial plates, adjustable vertically but fixed horizontally, divide the space above it into a suitable number of compartments; these plates are made reasonably tight against the moving sides of the tank by rubber or strips of canvas easily replaced when worn out. There is virtually then a series of stationary compartments above the filter, containing different depths of pulp under which the filter is passing.

The pulp is delivered from a fixed launder upon the slowly revolving filter and is subjected to the effect of the vacuum during about seven-eighths of the revolution and to the compressed-air and cleaning one-eighth. At occasional intervals it is easily and thoroughly washed out, by turning solution into the compressed-air channels and reversing the currents through the filter, the solution used in the washing being immediately returned to its proper channel through the vacuum-chamber during one revolution.

Whether the washing of the slime can be accomplished in the revolution or not, needs some further investigation. The present design contemplates the use of a second filter with the addition of the wash-water and agitation between the two filters. Without going into further details, which will be cheerfully furnished to anyone so desiring, it may be said that the mechanical arrangement is very simple, and provision is made for the ready replacement of wearing parts.

The change in the older methods of slime treatment to the vacuum-filtering is based mainly on the use of vertical groups or a 'basket' of filters, no filter of the horizontal-revolving type, so far as I am aware, being in use in the United States, although the Ridgeway revolving filter is stated by Mr. Alfred James (in your issue of January 5, 1907) to be in successful operation at Kalgoorlie, and an installation of a 500-ton plant is now under construction at the Great Boulder mine.

While local conditions may have required the adoption of the 'basket' type, it does not appear that the mechanical elements of the general problem have been met in a scientific manner. The intermittent character of the work done involves the application, at intervals, of relatively high-powered appliances for use during short continuous periods. It may be said that the use of 10 horsepower for two hours consumes no more power than the employment of two horse-power for 10 hours, but the larger plant involves the greater capital outlay, with its interest, which is a legitimate charge against the cost of operation.

The vertical 'basket' is immersed in a tank of pulp and during the filtering operation agitation is necessary to raise the particles of higher specific gravity up to the filter and, further, lifts are installed to pour the pulp taken from the bottom of the tank over the top of the filter; both operations tending to produce currents in conflict with those generated by the flow of the filtrate through the filter, thereby retarding the accumulation of the solids and causing further capital outlay, additional consumption of time and cost of operation. For the settlement of this finely divided matter in suspension, freedom from agitation is usually regarded as essential; but here the particles moving vertically must be seized by the inflowing currents as they pass and held by the expenditure of sufficient force to produce the adhesion, the aggregate vertical component of which must equal 18 tons in the case of the Standard company's plant at Bodie. This, it seems to me, must be much greater than would be necessary in a horizontal filter, where the application of the force should be just sufficient to produce the desired separation of the liquid from the solids and produce a minimum compression of the latter consistent with the removal of the desired amount of moisture, while in the vertical filter a maximum compression would seem desirable to furnish the necessary adhesion. In other words, gravity would aid continually in the accumulation of the cake in the one case and would be working in conjunction with the atmospheric pressure, while in the other the applied forces of the vacuum and agitation are working in conflict with each other and with the natural force.

The lifting, transfer, washing, and final discharge are all operations requiring the expenditure of power increased by the intermittent character of the work. As an offset to these features, it is true, there is obtained a very large surface for filtering. This in itself renders necessary the maintenance of the vacuum against the increased filter-surface; and the question naturally arises

whether it is not possible to spread out, as it were, the whole operation, or instead of taking it in chunks at long intervals, to take it in smaller pieces at uniform short intervals, or making the intervals short enough, continuous, and at the same time utilize the important element of gravity.

Again, the introduction of any considerable quantity of sand not ground to the requisite fineness interferes materially with the adhesion of the cake to the surface of the filter, and were it not for the necessity of the extremely fine grinding to insure the success of the filtering operation, it is highly probable—from the point of view of satisfactory extraction of values alone—a point in the fine grinding might be reached at which it would be more profitable to discontinue the attempt to reduce practically all of the product to the 150 or 200-mesh size and allow it to pass with a larger proportion of coarser material. The interference of the coarser material with the successful operation of the vertical filter is illustrated in Mr. Nutter's paper, in which he says that at a time when the tube-mill was out of commission "the Moore plant limped along as best it could without re-grinding."

On a horizontal filter the admixture of sand would have the effect of rendering the cake more permeable and facilitate the operation without in any manner interfering with the handling of the residue. In fact, the admixture of a suitable amount of sand to the pulp as it reached the filter might be found to be a positive advantage.

The important element of cost of installation, as far as can be learned from these recent publications, is as follows:

The Standard plant is stated by Mr. Brown to represent a cost of installation of $60,000, although with the knowledge now available it could be duplicated for $45,000, or approximately $450 per ton of capacity. The interest on this outlay would be $2,700, representing a charge of 7½c. per ton on a basis of 3,000 tons per month. Mr. Bosqui gives the cost of installation of the Merrill plant as $300 per ton of capacity and the cost of the plant as $400,000, representing an interest charge of slightly in excess of 4c. per ton on a basis of 1,600 tons per day. I have not seen an estimate of the cost of the Butters filter.

The estimate of the cost of installation of a horizontal type, using two filters, one for the direct operation of filtering and the other for the washing, will not exceed $10,000 for a 100-ton plant, $100 per ton of capacity, with an interest charge of 2c. per ton. This cost would probably be reduced by local conditions, the amount of power that could be furnished by the existing power plant of a mill, and other considerations.

The Moore filter is pronounced by Mr. Bosqui to be the origin of the great change produced during the year 1906 in the treatment of gold ores by the cyanide process, and the basket type of filter receives the endorsement of men of pronounced eminence as specialists in the particular line to which these devices pertain, strengthened by increased recovery over methods heretofore in use. Great as has been the advance, I have ventured here to draw attention to a few considerations, from the rational point of view as distinguished from the practical, that appear to me to have a bearing on the economical features of atmospheric filtering.

EDWARD PARRISH.

Newport, R. I., January 12.

AT Tombstone, Arizona, there are represented three types of ore deposit, within a limited area, namely, 'true fissure' veins; 'blanket' veins, in the bedded limestone; and a huge mineralized dike, often 50 feet in width and traceable for nearly a mile.

Homestead and Timber Entries on Mineral Land.

During the past two months many complaints have been received by the State Mineralogist, Mr. L. E. Aubury, from miners stating that mineral lands were being entered in northern California by homestead and timber entries and that the miners' rights were being infringed upon. The timber speculator is again busy in Siskiyou, Del Norte, and Trinity counties. In Tuolumne county, homestead entries are being made on the Table Mountain channel. This channel is well defined and millions of dollars worth of gold have been extracted from it. The overlying formation of this channel (scoria) is of such a nature that it is impossible of cultivation and is not even fit for grazing purposes, and the boldness of those who attempt to acquire this land by other than mineral entry, illustrates how little regard speculators pay to the oath (required in making such entries) that the land is non-mineral in character. On account of similar practices, President Roosevelt issued a recent order to all United States Land Offices in California directing that where applications are made for patent, the land must first be examined and reported on by a Government officer.

Complaints have also been received by the State Mineralogist from Mariposa and El Dorado counties where homestead and timber entries have recently been made on mineral ground. Mr. Aubury, in speaking of the matter, stated that he had secured the names of many persons who had made false entry, with a description of the land, which it was sought to grab from the miner, and he has placed the information in the hands of the officers of the U. S. Land Office. The persons making this class of entries will probably be allowed to take the non-mineral affidavit oath at the U. S. Land Office in their district, and after committing the perjury, will be arrested and arraigned in the U. S. Courts, and examples will be made of them.

The State Mineralogist has also received many complaints from miners in Kern, Inyo, San Bernardino, and Riverside counties about the large number of claims that have been located by one person. In Death Valley, one man has made over 350 locations, and in Greenwater, one man has located a territory about ten miles in length. In all the counties mentioned, other than those noted, the locations made by one person vary from 40 to 200.

While recognizing the greed of some of these locators, Mr. Aubury says that under the present laws operative in this State, there appears to be no remedy. If the locations are made on mineral ground and the claims properly staked, and notice of location posted on the claim, the locator can hold them. Further, it is not even necessary for him to record his claims under California law, so the real prospector is shut out. Mr. Aubury says: "The only way that I can see to overcome the difficulty is to make a change in our mining laws, and I am heartily in accord with and favor a law that will be similar to the present Nevada law. Every locator of a lode-claim should be forced to properly stake or monument his claim on discovery. A copy of his first location notice should be filed for record with the District or County Recorder within 30 days. He should then be allowed 60 or 90 days in which to sink a shaft 4 by 6 ft., 10 ft. in depth, or a tunnel, drift, or cut, equal to the same dimensions, this work to be performed only where evidence of mineral exists, and *not in the softest spot to be found on the claim*. This should also apply to gold-placer claims, in so far as the work should be performed on an exposure of gravel or gold-bearing material, excepting where there is unquestionable evidence of a buried channel. After work is done, the locator should file for record his proof of labor and final notice.

Cornish Tin Mining.

Written for the MINING AND SCIENTIFIC PRESS
By H. E. WEST.

'Copper, Fish, and Tin,' these form the significant trade-mark of the county of 'One and All.' Cornishmen are fishermen, and Cornishmen are miners. Copper production had almost ceased, fish had become a diminished item, and tin production had so fallen off that from Dartmoor to Land's End only a few mines remained working, and of these only the very hardiest maintained dividend payments. The St. Just district had but one active mine, namely, Levant; St. Agnes had Wheal Kitty; Camborne, Dolcoath, and some half a dozen others; St. Austell, Clitters Ltd.; Redruth, that old centre of mining, not one.

The ancient industry was all but doomed when, after some significant signs during the past few years, tin bounded to over £200 per ton and carried Cornish mining upward with it. Again is the ancient industry rejuvenated; the hearts of the 'adventurers' take fresh courage, as over the length and breadth of the land there is an awakening of hope; old 'setts,' long abandoned, are again being equipped for production.

Just how far this marvelous revival is likely to go is hard to say. It is almost incredible to those of us that have seen mine after mine abandoned, and this old county denuded of its hardy workers; we cannot realize the complete renewal of this industry, yet, with tin at £150 per ton and over, all things are possible. Mines died, not because they were worked out, but because, with tin at £60 per ton or less, they could not be made to pay. No mine in Cornwall is down to 3,000 ft. vertical; Dolcoath approximates this, but most of the workings are comparatively shallow.

Men who are competent to form an opinion say that tin will remain over £150 per ton for some time. The production is inadequate to the demand, hence the rise and continued high price of the metal. Fully two-thirds of the world's tin supply comes from the Straits Settlements and Dutch East Indies, where the mining is entirely alluvial. There is said to be little chance of any large increase in supplies from these deposits. Australia and Tasmania are not large producers. In the United States, Alaska has the only promising tin region. Bolivia has a large area traversed by tin-bearing lodes of phenomenal richness, but the mines are inaccessible to railroads at present, and the difficult transport—principally packing by llamas—limits production. A large and sudden increase of tin is deemed, therefore, practically impossible, hence the maintenance of the high price of tin and with it the hopeful outlook for Cornish mining.

Cornwall is the oldest tin-producing region in the world. The industry probably dates from several centuries before the Christian era. The isles of Scilly, off its coast, were known as the Cassiterides, or tin islands.

A Group of Cornish Tin Mines.

Market Jew, or Marazion, was the market for tin, and St. Michael's Mount was the shipping port in the days of the Phœnician triremes. So much for those far-off days. From then until now the mines have been worked. Forty years ago, or perhaps a little more, Cornwall was in the heyday of its prosperity. Today empty engine-houses are silhouetted against the sky-line of her hills, or silent ruins stand embowered in her valleys. The 'bobs' no longer beat as ceaselessly as the clock-tick, and, indeed, in all but a few instances, they have been dismantled and have gone into the scrap heap; the quiet of desolation is supreme. And this is the picture of the times it is proposed to quicken into life, and all because tin is over £150 per ton. Cornishmen have always taken a world of beating, and the sons are equal to their sires. The proposition is by no means hopeless. There are areas of tin-ground yet unprospected, most developments are of shallow depth, none are so deep but that they might be doubled—conditions being equal. Improved dressing plants have rendered complex ores of tin amenable to treatment.

Cornishmen are proverbially conservative. There

seems a fatuity about the place and the men, who abroad are alive to every improvement and up-with-the-times, and who on their return to their native county, bow to the inevitable and tread in the well-worn footsteps. Big things can be done with a good balance at the bank—nothing without it. The cost-book system of the past expected much of its manager and gave little. This factor, more often than not, is accountable for the backward state of equipment at the mines. Managers were afraid to increase expenditures on a struggling mine, and at times were denied absolute necessities. Vigorous exploitation cannot be undertaken with a depleted cash-box, and exploration costs money. When developments fall behind and the mine can barely be kept alive by returns, without capital to prosecute developments, the fate of that mine is dismally certain. Now all this is being changed, limited liability companies replace the groups of adventurers, working capital is forthcoming, and equipment will be provided, in most cases new. The mines are in a position to get modern and efficient machinery.

Power is the next item of importance. There is talk of a central station for the generation of electricity. The centralization of the generating plant and an efficient system of distribution is the secret of cheap power. A central station situated on the seaboard, using coal and gas engines, could doubtless supply the whole of Cornwall—with a trunk line 20 miles long, three-phase system, carrying 40,000 to 60,000 volts, and on a basis of 10,000 h.p. minimum—at a cost not exceeding $75 per h.p. year. Synchronous mill and compressor motors, with motor-driven multi-stage centrifugal pumps, would do much toward the cheapening of power charges even at two or three times the above quoted figure. Such things are accomplished today in Mexico, and on no mean scale. Why not in Cornwall? Coal can be landed at 75 cents per ton above the price at the pit-mouth, and in quantity.

Here follows a brief review of the past and present equipment of Cornish mines. The Cornish pump is universal; the huge beams of 20 tons or more, with steam cylinders up to 100 in. diam., and the large wooden, or more modern iron, pump-rods with the cumbersome and costly equipment of pump-lifts and balance-bobs down the shaft, should nowadays be relegated to the past, even as the old Cornish stamps, with their ponderous stamp-axle, square lifters or stems, and cast-on heads, have made way for the high-duty Californian type; and as the classic 'buddle' has been supplanted by the several forms of percussion and shaking tables. Much improvement yet remains in the concentration, termed 'dressing,' of the ores. More gradual reduction, magnetic separation, and comprehensive slime plants should raise the percentage of extraction. The last feature should be especially developed since, on account of the intimate association existing between cassiterite and its gangue, comminution of the particles is essential, and the fact of the sliming property of cassiterite thus finely ground being almost incapable of settlement in water within a reasonable distance and period. Tin 'capel,' as the tin ore is called, is usually very hard, but gradual reduction through breakers, rolls, and stamps, would efficiently perform the coarse crushing and reduction; and tube-mills might prove serviceable for the finer grinding of the middling, or 'whits.' Belt equipments for the handling of ore and tailing, when, in the latter, sluicing is not adaptable, would cheapen the cost of handling.

Tin veins rarely occur out of the granite, or far from its contact with 'killas,' or slate, in Cornwall. 'Greissen,' a granite without feldspar, is, indeed, the habitat of tin the world over. The oxide, or cassiterite, is the tin ore of commerce; 'wood-tin' is the same mineral, and owes its name to the annular arrangement of its particles. Stannite, or the sulphide of tin, is merely a cabinet curiosity. The accessory minerals are quartz, calcite (or 'spar'), fluorspar, barite (locally termed 'peach'), and tourmaline; and of the metallic minerals, mispickel, pyrite, and wolfram, are the most common. Tantalite occurs in the Breage district.

The general strike of the veins is east and west, although, as a matter of fact, they vary little short of the quadrant from north to east. The popular opinion is that what is termed a 'true tin lode' must have a strike approximating east and west. This is often the case, but there are others. Usually the dip is steep, although there are exceptions—as on the great flat lode, typified by the Wheal Grenville mine, and in the St. Agnes district by Wheal Kitty.

The orebodies are both impregnations and molecular replacements, fluoric acid being deemed the dissolving medium—on account of the presence of fluorine minerals, such as fluorspar. The stanniferous contents are supposed to have been deposited from thermal solutions coursing through the small and central fissures, and presumably gathered from the sparse occurrence of tin in the igneous rock. Cross-courses, or displacements by dikes of diabase and allied eruptives—locally termed 'greenstones' and 'elvan'—are common. The great cross-course east of the Dolcoath sett is a typical example, it has served as an impenetrable barrier for water and has exerted an influence on the enrichment of the deposit.

The St. Agnes mines, notably Wheal Kitty, contain beautiful examples of reversed faults; these veins occur in the slates or 'killas,' with a decidedly flat dip.

The tin contents of the workable deposits vary; at Dolcoath, the leading mine of the county, the yield on the lowest level is over 1¼ cwt. tin per ton, that is, over 6% black tin. This is unusual; probably 2½% is a fair average of the tinstone stamped during the last few years; but this, again, depends on the price of the metal. The higher the metal, the lower value the ground that can be profitably worked.

Tin is usually returned in percentage of black tin, that is, the 'concentrate,' which assays from 60 to 70% metallic tin for the highest grades, and, in consequence, must be very cleanly dressed. Secondary grades are considerably lower. The returns in pounds sterling per fathom is happily giving place to more intelligible forms—such as pounds per ton, or the percentage, of cassiterite. The assay of tin is roughly ascertained by the vanning shovel and gives a working result, rather than the absolute contents of the sample—the return always being in black tin per ton of ore, or per fathom.

Clitters Limited mines have been largely instrumental in determining the practicability of the successful dressing of complex ores, containing, in addition to tin, considerable quantities of arsenic, in the form of mispickel and other impurities. The mineral contents per ton (exclusive of arsenic) are 21.28 lb., a considerable portion of the ore milled coming from the old dumps—left from the days when complex ores were practically unworkable. The high prices of black tin, at about £100 per ton, with the sale of the other products, has permitted remunerative returns. There are numerous properties in the eastern and middle part of Cornwall with like ores, hence the importance of this successful experiment. The metals derived from the ore are said to be worth 16s. 11d. per ton, with a working cost of 13s. 8d., leaving a profit of 3s. 3d. per ton treated. Minerals of like specific gravity cannot be separated from each other efficiently by any form of water concentration; after roasting, however, these equal-weight ore particles assume varying properties electrically, that is, they become either positive or negative, or good or bad conductors. Good conductors are

pyrite, chalcopyrite, marcasite, pyrrhotite, hematite, magnetite, siderite, cassiterite, wolframite, rhodonite, garnet, galenite, and graphite. Bad conductors are quartz, dolomite, calcite, barite, apatite, sphalerite, smithsonite. By magnetic separators, therefore, it becomes possible to separate minerals of equal specific gravity and having opposite electrical properties, as galena and blende, or, of like property, as cassiterite and wolframite. Advantage has been taken of electrical separators, such as the Wetherill, in these modern concentrating plants.

The black tin is sold either privately or by auction to local smelters, which reduce it when mixed with 'culm' (small anthracite), lime being added as a flux, if excess of silica be present. The furnaces are reverberatories, coal-fired. It is then run into ingots as pig tin, and subsequently, remelted and refined. 'Poling' with wet green apple-logs is a feature of refining and is effective in bringing dross to the surface. Cornish refined tin is the purest in the market. Straits tin is, however, largely purchased and, presumably, mixed with home tin, thus grading the quality of the former.

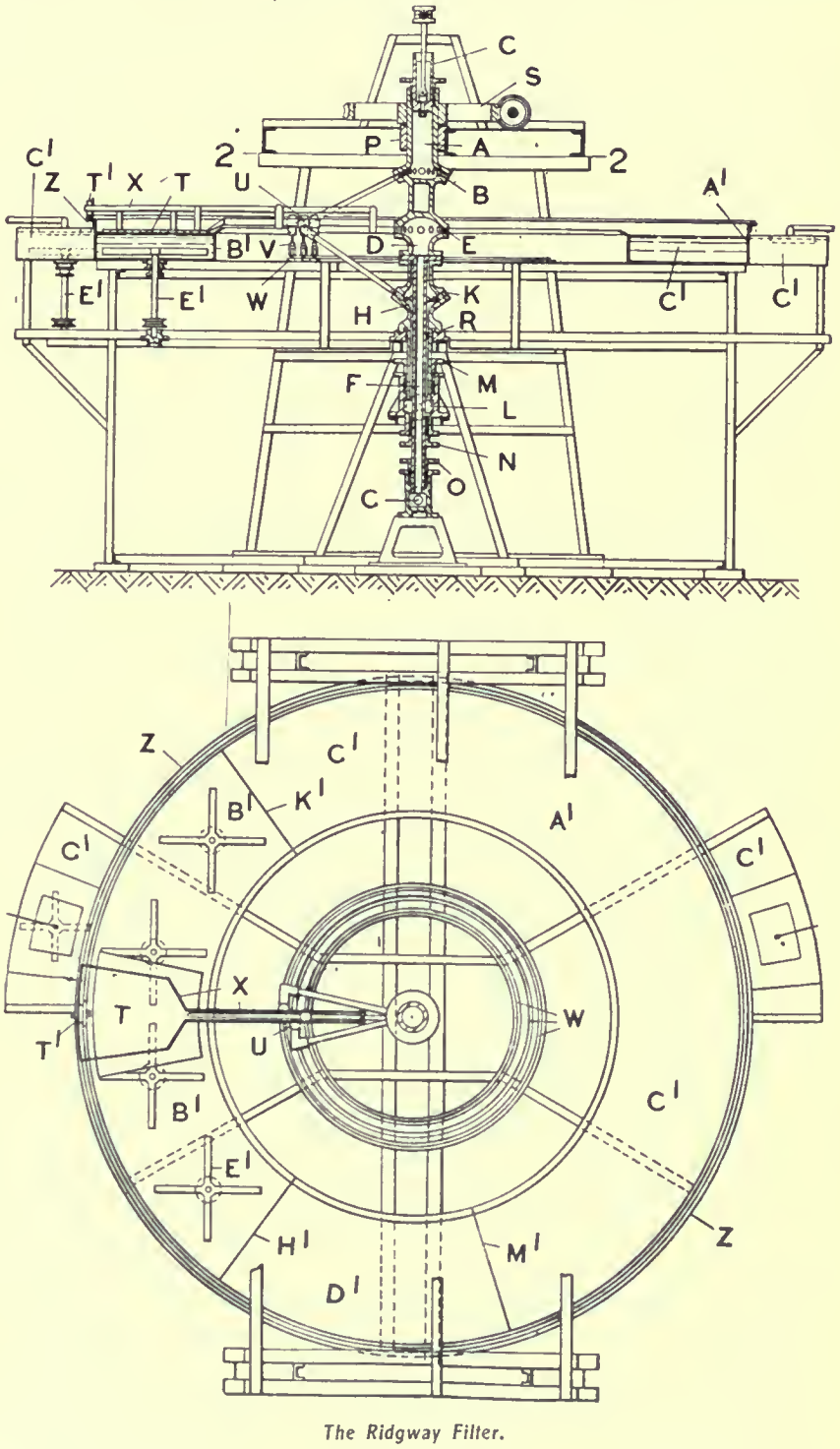
THE periodicals devoted to the literature of science have proved to be a most useful and at the same time a most interesting aid for all kinds of work in any way connected with science. In our age, which is turning from a narrow specialism to a broader conception of all scientific problems, the use of this aid will become more and more general, and what, up to the present, has been a luxury for a few, will become a necessity for everybody. As the giant of Science retains the use of his strength only through contact with mother earth, and becomes powerless when lifted into the airy regions of pure speculation, so, in the same way, the knowledge of science retains its true life in the mind of the individual only when it is continuously stimulated by immediate contact with the works of its great masters.—*W. Ostwald.*

IN the electrical industries aluminum could be used as a substitute for copper for some purposes in large quantities. But the demand for aluminum has also been greater than the supply, and the sole producer is said to be many months behind in his orders. The price of aluminum has, therefore, naturally been high; the parallelism between the price fluctuations of copper and aluminum is, of course, is no sense incidental. While it is estimated that the output of aluminum was 30% larger in 1906 than in 1905, a very much larger increase is expected for 1907, since the Pittsburg Reduction Co. is making the strongest efforts to fortify its already very strong position during the remaining two years for which it is protected in the monopoly by the Bradley patent.

The Ridgway Filter.

*This invention is designed particularly for treating slime containing gold in solution. A trial machine was built on the Great Boulder mine, at Kalgoorlie, and has been constantly in operation since January, 1906.

This machine consists of 12 flat cast-iron filtering frames (T), which are in the form of sectors of a circle.



The Ridgway Filter.

The frames are corrugated on their under surfaces, and to these corrugated surfaces screens are attached; ordinary filter-cloth is fixed over the screens. The frames are suspended horizontally from radially arranged levers (X), the inner ends of which are connected to a vertical centre column or spindle, provided with internal compartments. Each filtering frame is also connected by three radial pipes and rubber hoses to different compartments in the central column.

The outer edges of the filtering frames form the periphery of a circle 12 ft. in diameter; immediately outside

* From the *Monthly Journal* of the Chamber of Mines of Western Australia. November, 1906.

this periphery is placed a circular rail track (Z), and to the outer end of the levers (X) are attached wheels or rollers (T 1), of 4 in. diam. The wheels support the levers and run on the circular track (Z), which is carried on the outer edge of an annular trough under the filtering frames. The trough is divided into three compartments — one for slime-pulp, one for wash-solution, and one (without a bottom) for residue discharge. The general level of the track (Z) is such that the frame has its lower surface only immersed; the track, however, has elevated portions so arranged that when the central column and frames are rotated, the wheels, in running up the elevation, lift the filtering frames out of one compartment, and, on descending, lower the frame into another.

The lower part of the central column has two passages, into which the solutions are drawn, by a vacuum, through the radial pipes that connect with the filtering frames — the vacuum being produced by a pump connected with the openings (G 1 and L) near the bottom of the column — air-tight connections between rotating and stationary parts being secured by means of glands and stuffing-boxes.

A nest of three valves (U) is placed in the pipes between the column and each filter-frame; each of the three valves is automatically operated while the machine is in motion by small rollers (V) passing over elevations on one or other of the three tracks shown at (W); the gold solution is thus delivered into one compartment of the central column through one of the valves, and the wash solution into the other compartment through another valve, thus providing for the two solutions being kept separate. A third pipe connects the third valve (at U) with the top or compressed air section of the column (at B), and while the frame is passing over the discharge chute this valve is automatically opened by its roller and a puff of compressed air enters the filter-frame and displaces the residue adhering to the cloth; the residue falls through the discharge chute (D 1) into a dump-truck. Each frame acts independently, having its own roller, set of valves, and connections with the central column; and each frame and its adjuncts form a complete self-acting unit. The accompanying drawing shows a single-plunger air-compressor (at C), self-contained and driven by the machine itself; the compressed air can, in many instances, be supplied conveniently from other sources.

The machine requires about ½ h.p., and is driven (in the direction of the hands of a watch) with a 6-in. belt on a 42-in. pulley keyed to the top of the central column (at S), and makes one revolution per minute. The vacuum is on the filter-plate the whole time it is immersed — whether in the pulp or in the solution wash. Each filter-frame is 13 seconds in the pulp (from B 1 to B 1), seven seconds on the elevated portion while passing from the slime to the wash compartment, 30 seconds passing through the wash (C 1 to C 1), seven seconds lifting and drying, and three seconds blowing residue off (at D 1). During the period in which the frame is passing from the pulp to the wash, the vacuum is on for one second only while the frame is rising, and one second only while it is descending into the wash, thus giving the pulp adhering to the underside of the frame an air-leaching of two seconds' duration. This period of leaching may be varied to suit the particular nature of the slime under treatment or the thickness to which it has formed on the cloth, which is usually about ⅜ of an inch. The supply of pulp, wash-solution, or water into the annular troughs, (B 1 and C 1), is regulated by means of float-valves in the receiving compartments (G 1 and G 1); the pulp is kept from settling by the revolution of small agitators driven by a rope passing round pulleys attached to their spindles, which project through glands and stuffing-boxes in the bottom of the receiver (at E 1 and E 1), etc. By means of the float-valve in the pulp-receiver (G 1), the pulp supply is taken automatically from the pipes through which the Dehne presses are charged; thus, in order to compare the efficiency of extraction by the machine with that of the presses, a portion of the general pulp is taken as each Dehne press is filled.

From 0.8 to one ton of wash is used per ton of dry slime, and the residues contain from 28 to 33% moisture, and from nil to a trace of KCN and soluble gold. The tonnage treated in 24 hours and percentage of moisture contained in the residues vary according to the variations in the pulp. With clean quartz slime of a consistency of from 42 to 44% solid, and a fineness of about 92% through a screen having 200 holes per linear inch, and a vacuum of 20 in., this machine will treat 50 tons of dry slime per 24 hours, leaving a residual moisture of 30 per cent.

On a clay slime the output will decrease to 25 tons per 24 hours, and the residual moisture will increase 35%. A trial was made on the old battery slime; the original assay value was 7 dwt., the gold in residue 18 gr., moisture in residue 35%, soluble gold in residue nil; this was treated at the rate of 25 tons per 24 hours.

Each frame has four square feet of filtering area and about 0.8 square yard of cloth is used to cover each frame. The life of a cloth on slime from the Great Boulder roasted ore is about 14 days, or 700 tons of slime for 9.6 sq. yd. of cloth.

The vacuum pump has a piston sweep of 80 cu. ft. per min., and, with a 20-in. vacuum, requires 3½ h.p. The machine itself, without the self-acting air-compressor, requires about ½ h.p., and allowing 1 h.p. for the agitators in the pulp-trough and pulp-receiver, and for friction in the counter-shaft, a total of 5 h.p. is required to drive the equipment described.

As the machine is absolutely automatic in its entire operation, no additional labor is employed in running it. Taking into consideration that this is the first machine made of this pattern, the repairs and renewals have not been abnormal.

The working costs during the last three months have been:

	Pence.	
Filter-cloth	0.3	per ton
Horse-power	2.4	"
Repairs and renewals	1.0	"
Total	3.7	"

It has been impossible to segregate the labor cost on this machine (other than those included in repairs and renewals), as during the whole run any slight attention necessary, other than greasing, has been performed by the shift-boss on duty.

The method of operating the machine is as follows: The agitators in the pulp compartment of the annular trough are first set in motion, being driven independently of the machine; the pulp-compartment is filled to normal level with agitated pulp, and the wash-compartment with wash-solution. The vacuum-pump is started, and the machine is set in motion by applying a tension-pulley to the belt on the pulley attached to the top of the centre column of the machine, thus rotating the centre column, which imparts the motion to the filter-frames by the pipes and levers, causing the rollers (T 1) supporting the outer end of the levers from which the filter-frames are suspended, to travel on their track (Z). As the action of all the frames and their connections is similar, one only need be described. Assuming that a frame has just passed over the discharge chute and is on the elevated portion of the track, it then descends an incline on the track to the normal level, and the cloth on the underside of the frame is immersed in the pulp; at the same

time, the gold solution valve (at U) is opened by a roller (at V) running up an incline on its track (W), and similarly to the action of the elevating rollers (at T 1) on the track (at Z), thus opening direct connection between the filter-frame and the vacuum which is maintained in the centre column; the vacuum draws the liquid through the cloth and leaves the solids adhering to it. The roller (T 1) on the outer end of the lever, while continuing on the level track, keeps the cloth submerged till another incline is reached, up which it then ascends, lifting the frame out of the pulp-trough; on descending the incline again to normal level, the frame is lowered into the wash-solution. When the frame ascended from the pulp, the gold-solution valve closed, and as it descended into the wash-solution the wash-valve opened, causing the vacuum to draw the wash though the adhering pulp, which is usually about ⅜ of an inch thick. The frame continues in the wash-trough during the travel of half the circle, and is then raised by similar means to those already described, but the wash-valve is not closed till the discharge chute is reached, thus allowing the vacuum to remove, by air-drying, some of the moisture from the cake of slime formed on the underside of the cloth. When the discharge chute is reached, the wash-valve closes, and the air-valve in connection with the upper portion (B) of central column is opened, admitting a puff of compressed air, which dislodges the cake from the cloth and precipitates it into the discharge chute (D 1), under which a dump truck is placed to receive residues. The compressed air required at the time of the discharge can be supplied in any usual way or by the self-contained arrangement shown in the drawing at C.

Enlarging the Anaconda Smelter.

During the year 1906 improvements have been made at this plant for which half a million dollars had been set aside. Now, nearly completed, they include the following additions to the plant:

At the beginning of the year there were two 51-ft. furnaces, and three 15-ft. furnaces in the blast-furnace building of the plant. These three have been thrown into one, making a furnace 87 ft. long, and based upon the 51-ft. furnace, with a capacity of at least 3,000 tons of charge daily. In this way the blast-furnace capacity has been raised 1,740 tons daily.

Eight McDougall roasting-furnaces in two rows have been installed in the roaster building, which should furnish upward of 300 tons of roasted ore. This is taken care of by one 116-ft. reverberatory furnace, with an output of 60 tons of 40% copper matte.

The Flint Creek power station has been re-modeled for the purpose of furnishing power to the concentrating-mill, where it drives motors that have been substituted for the steam-engines heretofore in use.

To have an assured and abundant supply of water for concentrating, the Silver Lake pumping station has been re-modeled, and a further supply is obtainable from Hoefner's pumping station at the race-track, the water being pumped in time of low water across from the old flume to the new one.

To dispose of some 230 tons of matte estimated as coming from the 2,040 tons of additional ore, two additional bays have been built to the last end of the converter building, and one of the two converter stands needed is being placed. This space also gives room for another slag-casting machine.

MANGANESE STEEL is an alloy of iron and manganese, incidentally, and probably unavoidably, containing a considerable proportion of carbon.

The Art of Exaggeration.

In these days one hears of $7,000,000 gold shipments, mountains of copper ore, veins of gold that rib creation, and other mining stories that find ready space in the daily press. Here is Mark Twain's reply, written many years ago, to one such yarn:

"I have just seen your dispatch from San Francisco in Saturday evening's *Post*," wrote Mark Twain on the subject of rich gold deposits at Calistoga springs, and about the proprietor's having extracted 1,600 oz. of gold of the utmost fineness from two barrels of water during the past fortnight, by a process known only to himself.

"This will surprise many of your readers, but it does not surprise me, for I once owned these springs myself. What does surprise me, however, is the falling off in richness of the water. In my time the yield was a dollar a dipperful. I am not saying this to injure the property in case a sale is contemplated. I am saying it in the interest of history. It may be that the hotel proprietor's process is an inferior one. Yes, that may be the fault. Mine was to take my uncle (I had an extra one at that time on account of his parents dying and leaving him on my hands) and fill him up and let him stand fifteen minutes, to give the water a chance to settle. Well, then I inserted him in an exhaust receiver, which had the effect of sucking the gold out through his pores. I have taken more than $11,000 out of that old man in less than a day and a half.

I should have held on to those springs, but for the badness of the roads and the difficulty of getting the gold to market. I consider that the gold-yielding water is in many respects remarkable, and yet no more remarkable than the gold-bearing air of Catgut cañon up there toward the head of the auriferous range. This air, or this wind—for it is a kind of a trade wind which blows steadily down through 600 miles of the richest quartz croppings during an hour and a quarter every day except Sundays—is heavily charged with exquisitely fine, impalpable gold.

Nothing precipitates and solidifies this gold so readily as contact with human flesh heated by passion. The time that William Abrahams was disappointed in love he used to sit out doors when the wind was blowing, and come in again and begin to sigh, and I would extract over a dollar and a half out of every sigh. He sighed right along, and the time that John Harbinson and Aleck Norton quarreled about Harbinson's dog, they stood there swearing at each other; and they knew how, and what they didn't know about swearing they couldn't learn from you and me, not by a good deal; and at the end of every three or four minutes they had to stop and declare a dividend. If they didn't their jaws would clog up so they couldn't get big nine-syllable ones out at all, and when the wind was done blowing they cleared up just a little over $1,600 apiece. I know these facts to be absolutely true, because I got them from a man whose mother I knew personally.

I do not suppose a person could buy the water privileges at Calistoga now at any price, but several good locations along the course of the Catgut cañon gold-bearing trade winds are for sale. They are going to be stocked for the New York market. They will sell, too, people will swarm for them as thick as Hancock veterans in the South."

OLD KING ARTHUR, who, in his wise, practical views of life, seems to resemble our Benjamin Franklin, gave the maxim: "Eight hours for work, eight hours for rest, and eight hours for play." Proper industrial training will bring about this consummation by increasing the efficiency of the workman.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Under a deed conveying mineral rights which provided that the grantee should have free access to the lands from any direction by roads and other pass-ways or means of exit and entrance it was decided by the Court that the grantee would have the right to construct such roads, pass-ways or means of exit, or entrance as might be necessary to get out the mineral, having due regard to the interests of the owner of the soil, and not inflicting upon him any unnecessary damages. It was claimed in this case that the provision in the deed as to roads and other pass-ways or means of exit or entrance did not give the grantee the right to construct a tramway. The Court decided that the tramway was necessary to facilitate the increased output from the mine, and that such a tramway was but an improved road or passway; that it took less space than a road would take, and would be less injurious to the land than a road, and that the grantee under the terms of the deed had the right to make and use the tramway.

Duncan *v.* American &c. Asphalt Co., (Ky.) 97 S. W. 392.

In an action to determine adverse interests in real property, the defendant based his claim to such property solely on a lode mining location. The Court found that the defendant was and had been since 1883 the owner and in possession of a specified portion of the disputed premises. It was held that this was an implied finding, that such mineral location was actually made in that year; that the land was mineral in its character; that the claim was properly monumented; that the annual work was done thereon as provided by law and the mining regulations, and that the claim was not abandoned.

Southern Cal. R. Co. *v.* O'Donnell, (Cal.) 85 Pac. 932.

It is the duty of the owner of a mine to furnish the miners a safe place in which to work; and where a miner was ignorant of the danger of the place in which he worked, and could not by ordinary care have discovered such danger, it was said to be the duty of the employer to inform him of the situation; and in the absence of an official of a higher position this duty devolved upon the foreman, under whom the miner was working. In States where the statute provides for the appointment of a mine boss, it is his duty to see that the place where the miner works is reasonably safe, and such a mine boss is not a fellow servant of the miner.

Low Moor Iron Co. *v.* La Bianca (Va.), 55 S. E. 532.

The rule requiring the owner of a mine to use reasonable diligence to furnish a reasonably safe place for the miners to work has no application to the miners or persons whose duty it is to make dangerous places safe. Such persons neeessarily assume the additional hazard of the particular employment. By this is meant that the statute does not require that the mine examiner shall aecompany the rockmen and personally direct them in removing dangerous conditions from the mine.

Kellyville Coal Co. *v.* Bruzas (Ill.), 79 N. E. 309.

Where the location was eross-wise of a vein which ran in a northerly and southerly direction, within a mining claim, and the side lines were really end lines, considering the direction of the lode on the surface, it was decided that the rights of the locators were restricted to the area, within the side lines 300 ft. on each side of such a vein or lode.

Southern Cal. R. Co. *v.* O'Donnell, (Cal. App.) 85 Pac. 932.

It has been decided that the rights of one entering upon the public domain and locating and working a mineral claim are of as high order as those of a settler, each of whom is in possession under rights initiated which may by the observation of precedent conditions ripen into the right to a final patent.

Southern Cal. R. Co. *v.* O'Donnell, (Cal. App.), 85 Pac. 932.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Glendale, Oregon, sent by J. W. S., is: Diabase.

Platy Barite stained with Limonite has been sent by J. S., of Bearmouth, Montana.

The specimen of radium ore sent by W. H. W., of Amalie, Kern county, Cal., has not been received.

Two rock samples from Wonder, Nev., marked H. G. G., are: No. 1, Diorite; No. 2, Quartz with black inclusions.

The specimens from Pocatello, Idaho, marked J. H. M., are: No. 1, Quartz and Limestone; No. 2, cherty Limestone.

The material sent by V. E. M., of Glendale, Ariz., is: No. 1, black Tourmaline; No. 2, Quartz and Pyrite; No. 3, Hornstone.

The blue mineral from Carson City, marked H. McC., appears optically and chemically to be Dumortierite, an alumina silicate sometimes containing boron.

Rocks from Los Angeles marked H. H., are No. 1 and 2, biotite Granite; No. 3, basic segregation from biotite Granite; No. 4, Pyrrhotite; No. 5, Quartz and Chalcopyrite.

The rocks from Tinemaha, Inyo county, Cal., marked A. C., are: No. 1, Diorite; No. 2, Sandstone; No. 3, decomposed granitic rock; No. 4, chlorite Schist; No. 5, similar to No. 3; No. 6, clayey material from the same kind of rock; No. 7, earthy Limonite and Jasper; No. 8, Jasper; No. 9, Quartz with oxidized Pyrite.

COMPRESSED AIR differs from electricity, especially in the fact that electrical friction losses cannot be regained, while corresponding losses with compressed air may be eliminated. The moderate fall in pressure in the air due to friction augments a loss of transmission. If the air were at 80-lb. gauge or 95 lb. absolute upon entering the pipe, and 70-lb. gauge or 85 lb. absolute at the other end, there would be a loss of a trifle more than 10% in absolute pressure, but at the same time there would be an increase of volume of 11% to compensate for this loss of pressure, and the loss of available power would be less than three per cent.

THE height of tides varies greatly in different localities. In the open Pacific it is only two or three feet. In the North Sea interference of two tidal waves, one from the north of Scotland, the other through the English channel, minimizes the effect. In nearly enclosed seas, like the Mediterranean, they are only a few inches high. The Channel Islands, to the south of England, have tides some 35 ft. high, while in narrow reaches such as the Bay of Fundy, into which large masses of water are driven by their momentum, the tide may rise 70 ft. or more.

WROUGHT IRON is graded as to the three factors: Tensile strength, reduction of area, and elongation. The average tensile strength is about 50,000 pounds per square inch, the reduction of area before breaking in the testing machine varies from 25 to 55%, and the elongation from 30 to 10 per cent.

The Big Shafts of Guanajuato.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

In my last article I took the reader to the Rayas mine. Just as I was about to describe the view, the exigencies of space in our issue of December 22 compelled me to stop. I give it now, as it appeared from the *mirador* or stone balcony on the morning of November 2, 1905.

In the distance to the left, the bold ridge of La Bufa, a scarp of rhyolite tuff, stood silhouetted against the clear blue. Under the overhanging brows of these cliffs and protected from the weather, there are figures of heroic size painted on the rock; they represent a red devil and his retinue tempting the Christ. In the cavern adjoining these are several paintings of St. Ignacio and the Virgin, done in color with as much skill as the similar work to be seen in the churches. This mountain top—from which may be seen Guanajuato, Silao, Leon, and the wide expanse of the rich Bajio—was supposed to suggest that from which El Salvador was shown the kingdom of this world and their glory, in the great temptation. Lower down, near the talus slope, the other temptations are depicted in a crude way. It is not said that the riches of the Veta Madre were offered; they have tempted many men to their undoing during the last two hundred years.

On the rounded foothills that extend from the base of La Bufa begins the residence portion of Guanajuato—it is called La Presa, because of its dominant feature, a big dam with an encircling park. Seen from a distance, there is a gleam of pink walls among cedars and the tops of some church towers; then the crest of a ridge intervenes. At the foot of this and in the cañada below the Rayas, there is a cluster of brown ruins, La Duran, the oldest *hacienda de beneficio* in Guanajuato, and contemporaneous with the discovery of the *patio* process, in 1557. A hundred yards below it, the bed of the stream is crossed by the slender line of an aqueduct, that now serves to carry the pipe-line which brings the water-supply of the town. The six pillars are capped by a series of broad keystones, that do duty as arches. This is a characteristic type of Mexican architecture.* Below the aqueduct, the cañada turns to the right and becomes fringed by Peruvian pepper trees, and beyond them is the big hollow in which the town of Guanajuato lies huddled—a multitudinous complex of walls—pink, yellow, and white—with red Moorish campaniles. The narrow river-bed is marked by a congestion of brown walls; on the onlooking slopes there is a decrease in this density of buildings and an increase of verdure, until the top of the ridges are reached, where there are no dwellings, but only the dark red earth of the cornfields, defined by hedges of organ cactus. Surrounding the town and overlooking it, are golden brown hills, with contours deeply eroded and steep ravines (*barrancas*), the culminating point being the cone of Cubilete. The broken skyline is carved in diabase, and the nearer slopes are eroded in the conglomerate that lies on the flanks of the main ridge.

A Glimpse of Guanajuato Between the Organ Cactus.

In front, beyond the huddled habitations of man and the brown hills crossed by the traveling shadows of clouds that fleck the vivid blue of the sky, stretches the purple interval that marks the Bajio, a great valley along which runs the Mexican Central—a most unromantic railroad, with slow trains, sloppy Chinese cooking, and a most distressing service. Beyond it, like the good things promised on the other side of this vale of tears, is the blue line of the Cordilleras, throbbing with soft enchantment and pulsating with the romance of mining that shall not die.

When luncheon was over we left the *mirador*, and in doing so passed through the remains of a pretty garden; it seemed strange to see the old-fashioned gilly flower, rose bushes, and violets among these mine buildings. They had a story to tell of the Englishmen who planted them. There was a time, from 1821 to 1850, when English capital irrigated the mining camps of Mexico,

*The 'flat arch' is held by some to be the oldest and simplest expedient for supporting a structure; it is supposed to have originated from the big stone placed over a doorway in the days before the idea of the true arch was developed. Other engineers, for instance, Mr. Carlos Van Law, are of the opinion that the flat arch was a development from the true arch, and that, in form and principle, it is the real origin of our modern 'invention' of fire-proof floor construction with its so-called arch-tiles.

and among them Guanajuato. Owing to the costly methods of operation, the attempt to employ only the comparatively expensive imported white labor, and the lack of experience in treating the silicious silver ores, these early efforts were generally unprofitable, although with their characteristic dogged determination, the English companies continued to operate the mines, with steadily diminishing intensity, for many years. While active work on any important mine ceased fifty years ago, they held on to the San Cayetano until a few months ago, when that property was transferred by the United Mexican Mines Association, Ltd., organized in 1814, to a new American company. Between the English period, already defined, and the present American dispensation, there was a good deal of work done under Mexican companies, although these lacked the enterprise of the heroic days at the very beginning of the nineteenth century.

The four great shafts on the Veta Madre are the Rayas, the Cata, and the two pits of the Valenciana, namely, those of San José and Guadalupe.

The Rayas is octagonal and 38 ft. diam., with a depth of 1,400 ft. Among the old machinery to be seen near-by is a Cornish hoisting engine of 1835 built by Harvey & Co., at Hayle, Cornwall. Alongside are two Lancashire boilers. In another building is a first-motion hoist built by the Union Iron Works, of San Francisco, in 1866; it is one of the best of the old style, with jaw brake and flat wire-ropes. The head-frame is built with timber struts footed in cemented masonry. This was erected in 1887, when the Rayas mine was unwatered. But there is a suggestion of methods used long before even this old machinery was set to work; the sites of the horse-whims used by the Mexicans is marked by a tablet inscribed to the patron saint of each operator. One, for instance, reads "San Francisco. Nov. 1, 1820."

The Cata shaft is 280 metres, or nearly 1,000 ft., deep and 20 ft. wide. At the collar, and for 50 ft. down, it is octagonal, with sides of masonry. I went down in a cage running on wire-rope guides, which gave one a feeling of detachment, for in places, below the portion that is lined with masonry, the shaft is 30 to 40 ft. wide. A native boy held a torch to illuminate the distant sides of the shaft. The torch used in the mines is worth describing: It is called a *mecha* and consists of 40 native candles, made of tallow and yarn, which are pounded into a mass and wrapped in a cloth with wood splints to stiffen it. Outside of this is a wrapping of *riata* or twine, obtained from the *maguey* plant. The torch is two feet long and 2½ in. thick; it is wetted outside, so that the tallow will congeal as it drips. By the light of it, when we reached the bottom of the shaft, we saw the Aldrich quintuplex pump, made by the Allentown Rolling Mills, Pennsylvania. It consists of a battery of five vertical plungers, all the five cranks inside, with two post-bearings outside. This pump is said to be doing good work, lifting 300 gal. per min. 880 ft. high, to the drainage adit.

The San José shaft was also known as the *tiro general* or general shaft of the Valenciana; it has been mentioned already in recounting the early history of Guanajuato. It is an impressive hole. There is none like it. It is octagonal, 33 ft. in diameter and lined with masonry for 100 ft. The bottom is at 525 metres or 1,625 ft. Water-level stood at 198 m. or 600 ft. at the time of my visit. This is the shaft of which it was truly said—among others, so I was informed, by Robert Bunsen at Leadville in 1881—that a man can read his paper at the bottom by the light of the sun, because here in the tropics during the summer solstice the sun for two weeks is vertically overhead. Early in July the mist caused by the sun's heat striking directly on the water at the bottom of the shaft causes a beautiful rainbow every day at noon. This is the shaft also of which William Jennings Bryan—who visited Mexico after his first silver campaign and was royally entertained—said, that he had never before seen a hole big enough and deep enough wherein to bury the gold standard. But he said nothing at all about the shallowness of the oratory of the river Platte! However deep the shaft may be, it will be filled up some day unless tourists are forbidden a near approach. From time out of mind it has been deemed great sport to throw stones down this vast pit and listen to the reverberations. I offered my tribute to the Tiro General. First one hears the sound of rushing wind—the echo of the passage of the stone through the air; then there comes a roar as it strikes the side of the shaft and this is followed by a crash as it hits the water. (In the light of later events I can tell my friends at Guanajuato that these sounds resemble the oncoming of an earthquake, to anyone living near the actual line of faulting.)

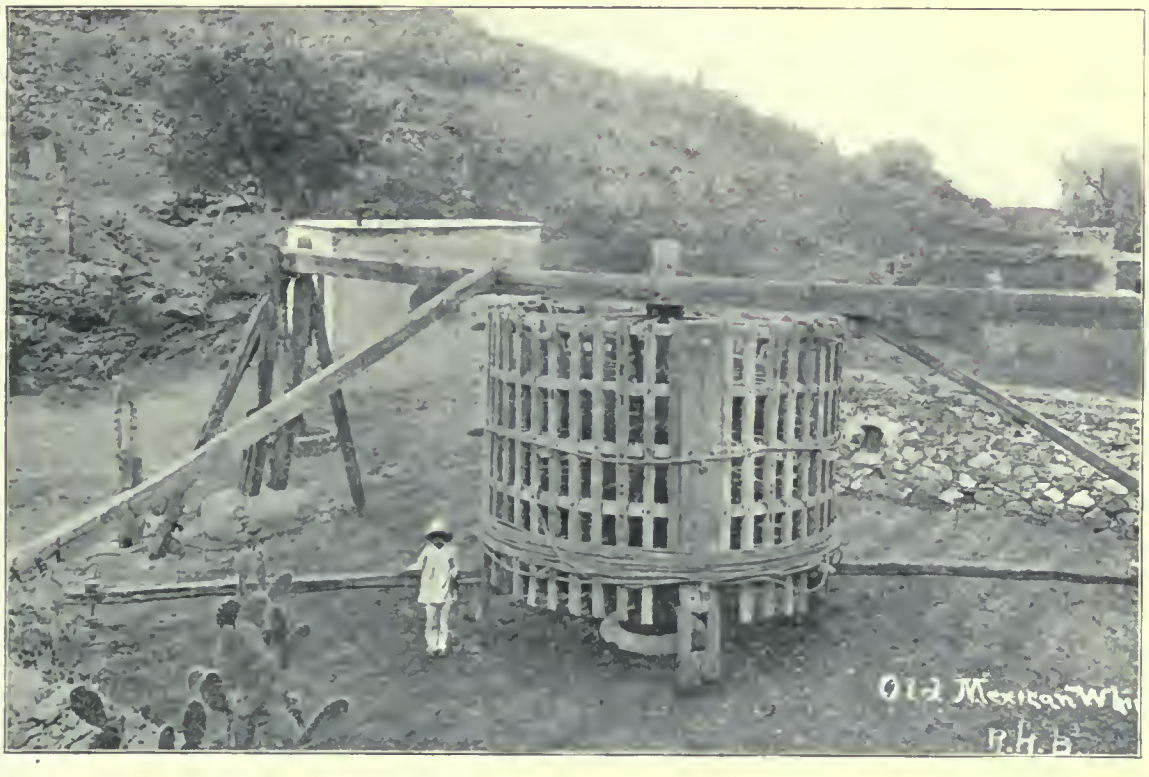
The shaft is octagonal, this shape being due to the method of hoisting prevailing at the time it was sunk. Around it, at a radius of 150 ft., can still be seen the ruined gables of the eight houses, each of which contained a *malacate* or horse-whim. A *malacate* is said by the Mexicans to be operated by *fuerza de sangre* or force of blood, as compared to the *fuerza de vapor* or steam-hoist. The typical *malacate* employed in this work was usually a vertical drum of oak or *mesquite*, from 12 to 16 ft. diam. and 12 to 14 ft. high, with a wooden central axis supported on iron gudgeons, top and bottom. The lower end of this drum was about three feet off the ground and to it were fixed four heavy *mesquite* sweeps of 15 ft. radius. To the end of each sweep were harnessed four horses, in crude rawhide harness, driven by a boy (seated on each sweep), at a gallop around the circle. Originally a hemp rope—later, a steel cable—was wound eight or ten turns around the drum, both ends depending in the shaft and hoisting in balance. The trip complete, the horses were reversed on the sweep and the return trip commenced. As, with the depths worked, the empty bucket, plus rope, considerably overbalanced the load when the latter neared the surface, the driving boys usually had to hop down from their perch toward the end of each trip and restrain the motion of the drum by holding back while the horses were turned out to one side and disconnected, all without stopping the hoisting. There was no brake on any of these old *malacates;* when it was desired to hold them at any given point, an attachment was made to the nearest fixed timber.

Rawhide buckets, made by sewing together two bulls' hides, were used exclusively. In these, both ore and water were hoisted, and the experience of American engineers has proved that for taking water out of shafts in sinking, the rawhide is better than anything else, being lighter and easier to handle in proportion to the quantity of water raised than any other form of bailer.

Over the shaft stands the shaky head-frame built in 1872 during the unwatering of the mine by the engineers of the Mexican company. They started with four winches, not over 20 h.p. apiece, and fooled along for nine years, finally getting the water out; then, in 1881, they purchased a good Fraser & Chalmers double-drum double-cylinder winding engine of 120 h.p. Mr. Dwight Furness, who was in our party, told me that when he visited the mine in 1888, the yard was full of women engaged in sorting ore. They sent 300 tons of clean ore to the mills, the remainder being shipped to Germany. These operations stopped in 1892, and the water has been rising in the shaft ever since. I saw some of the little hoists used in 1872; they had teeth-gearing made of mortised wood; they came from Manchester and were brought on ox-carts from Vera Cruz, a distance of fully 500 miles.

The unwatering of the shaft must have been a wonderful spectacle; the story of it is told in the old company's records. When they began, there were four steam-hoists raising as many iron buckets restrained by wire guides. The water being high in the shaft, it was not possible to anchor the guides to the bottom, so they were attached to a big wooden float, which was weighted until it sank. Then the upper ends of the guide-ropes were run over sheaves, in order that they might be paid out as the water was lowered. So long as only one hoist was running, all went fiuely; but when all four got to work, the apparatus, that is, the float, guide-ropes, and *toneles* (bailing-buckets) commenced to twist until the whole lot of them were completely wound up in an utterly hopeless tangle. The bailing operations had removed the water unequally over the area of the shaft, and this had created a vortex that caused the float to move around, twisting the 16 ropes used as guides and the eight more employed in balance-hoisting, until with the cables and guides, completely interrupting the maneuvres. Many times we four engineers repeated the trial through a whole day, and the following day with only three (since he who recites this fell ill), without obtaining any favorable result. The three companions came to the bedside of the patient completely disheartened and sad, as was to be expected, but at the same instant the same exclamation burst from the mouths of all, the very syllables falling together, without anyone of the four being able to say, 'I was the first to speak'; we shouted, '*We will secure the fixity of the frame with diagonal props resting against the walls of the shaft*'! This common idea was the equivalent of the *Eureka!* of the Greeks. It raised the patient from his bed, re-established happiness and, when put in operation, it gave the much desired result. The ninth day of June, 1873, the unwatering was inaugurated with great solemnity."

What a scene it must have been; the courtyard fairly buzzing with the noise of the little hoists, the shouts of the



A Mexican Malacate or Horse-whim.

rapidly increasing gyrations, the float became the base of a tangle that baffled description and made the engineers hysterical.

After the unwatering was completed, in 1881, Miguel Rul made a speech* before the Guanajuato Society of Engineers, and in that speech he dwelt upon their early troubles. The speech is on record. He describes the cylindrical sheet-iron bailers, made of galvanized sheets of No. 22 iron, with wooden bottoms and rawhide valves; he tells of the various difficulties with the valve mechanism and over-winding, and then he finally comes to the trouble connected with the attachment for the eight wire-guides below the surface of the water in the shaft. I quote his words: "On making the general trial with the four hoisters, after many partial trials which had resulted well, we noticed a phenomenon which disconcerted us. The effect of the different movements on the single timber-frame, to which the guides were attached below water-level, commenced to stir the water and to produce a tumultuous motion of rotation, which finished by resembling a water-spout and winding up bewildered engineers, the imprecations of the workmen, and the tremendous turmoil of the water in the big shaft as the guide-ropes twisted into a hopeless coil! And then the silence when the whole came to its fatal conclusion, the operations remaining suspended until those three mine captains, gathered around the bed of their invalided comrade, were suddenly inspired with the happy solution of their trouble. The courtyard is empty now, the waters have again invaded the shaft, and the vertical shafts of sunlight once more pierce the gloom above the stagnant pit.

A little farther north is the other great shaft, that of Guadalupe, which is 22 ft. diam., and 325 metres, or 1,072 ft., deep. It has a hexagonal collar built of masonry; through it a great deal of material was hoisted, the dump being the largest in the Veta Madre, containing 350,000 tons.

As a rule the miner does not choose the top of a hill for the site of his shaft; he goes where he can economize on his sinking, without depriving himself of the chance to distribute the waste rock. At Guanajuato the shafts are on knolls, some of which rise to the dignity of hills. The reason for this was the space the Spanish miners wanted

*This speech, before the Guanajuato Society of Engineers, was published in their *Bulletin*, and is dated August 5, 1888.

for their *malacates* or horse-whims. At each shaft there were so many of these that a yard of 100-ft. radius was required. When this had been planned, they would begin to construct a wall just beyond the end of the arms of the *malacate*, the wall being built with the waste (extracted from the shaft), which was then filled into the enclosure until the yard had a level surface. The *haciendas* were rarely near the mine, they were erected in the town, for the sake of safety and convenience. The ore was carried on mules to the *patio* establishments, which were custom mills.

The mines were not worked by their owners but by parties who secured a lease in perpetuity, termed an *avio*, which gave them (the *aviadores*) the right to do what they pleased in the mine, and to make contracts for the disposal of the ore. The *aviadores* charged, as a lien against the mine, all expense of whatever nature they incurred, such as development, operation, taxes, plant—in fact, everything. Against these items they credited the net returns obtained from the sale of ore, but being able to dispose of it wherever they pleased, they built *haciendas* on their own account and then made numerous contracts for the treatment of the ore, and mixed the several grades of it so that the yield could not meet the treatment charges. Then, as the owner never got a *centavo* unless there was a balance to credit, he never received anything. The mine ran up an ever-increasing debt until it amounted to an impossible sum; thus, for example, in the group of mines held by the Guanajuato Mines & Reduction Co., the indebtedness amounted to 6,000,000 *pesos*, most of this sum being entered against four properties—the Rayas, Mellado, Cata, and Valenciana.

The American company bought the *avio* contracts and the debt becomes due to these new owners; the company inherits all the old contracts, including the agreement for ore-treatment; it will never have to pay the old —almost nebulous—owners unless the profits to the mine from sale of ore to reduction works first repay the accumulated interest and then grow into a surplus. All the contracts are based on the old treatment charge, which was: 360 grams silver per ton to be deducted from contents of ore, the balance to be paid for at the rate of 3 *centavos* per gram; and the gold contents up to 6 grams per ton to be paid for at the rate of 30 *centavos* per gram; between 6 and 15 grams the payment to be 45 *centavos*. As the average ore of the best mines contains 350 to 400 grams silver and 3 grams gold, it is pretty obvious that the *aviadores* will not have to make an accounting. Several attempts, naturally, have been made to break these curious Spanish contracts, but in vain. The *aviadores* are the unquestioned owners of the mines today and no court can invalidate their peculiar rights.

The new enterprises at Guanajuato have swallowed the *avios*, and all the big mines have passed out of the hands of the native population. It is a fact that the Mexicans look upon the American operations with scepticism, largely because earlier efforts made by foreigners came to grief. They are inclined to regard with humor the removal of dumps and the working of abandoned mines; in consequence, although the old work was done by their own people, only a few local merchants have any financial interest in the present profitable undertakings.

IF the basin of the Great Lakes continues to tilt toward the west at the present rate of movement, Niagara Falls will be intermittent in 15,000 and dry in 25,000 years. The discharge will then go through the Mississippi river and to the Gulf of Mexico by way of the drainage channel in the vicinity of Chicago, as it did before the glacial retreat.

Effects of Extreme Cold.

E. L. Parsons, an old-time Yukon miner, just returned from the frozen North, told some remarkable stories of happenings at Dawson City, when the thermometer drops many degrees below zero. He said:

"Strange manifestations appear as a result of the extreme cold. A fire in the stove roars and crackles like a great forge, and wood seems to dissolve in the flames like a chunk of ice; the wood is gone and you wonder what became of the heat. At 60° below zero every stovepipe throws out a great white cloud of smoke and vapor, which streams away for fifty or one hundred feet, mingling with the other white-gray mist or haze that remains permanent in the atmosphere, like a fog, whenever such a low temperature is reached. This white-gray fog is not the fog Easterners know, but a frozen mist; every man, woman, child, animal, and even the fire that burns, is throwing out moisture into the air which is immediately turned into a vapor, which remains visibly suspended in the air.

Prospectors in attempting to boil a dish of rice or beans upon a camp fire unprotected from the weather find that the side of the dish which is in the fire will boil while that part exposed to the weather remains cold. Edged tools subjected to this temperature become as hard and as brittle as glass and break as readily under strain. I have seen a safety-valve blowing off steam, with the temperature 60° below zero, with icicles hanging to the valve, having formed from condensation. These icicles did not melt in the outrushing steam, but remained there for many days."

Mr. Parsons told of some instances when a frozen foot, ear, or hand had been thawed by immersion in coal oil for some time—often for several hours. He said: "This is absolutely a safe remedy and one thus escapes the surgeon's knife, as no bad results follow. This is not hearsay, for a man from our camp was found after he had been out all night with the thermometer 50 degrees below zero, and both his hands were frozen to the wrists. He was taken into camp and his hands soaked in coal oil for five hours. All the frost came out and not even a finger tip was lost. The doctors were amazed; as they thought amputation would have to be resorted to." The temperature of the oil should be about the same as that of the living room. Great caution should be exercised during the extremely cold weather not to freeze the lungs, which one will quickly do if he hurries about. Quick and fatal pneumonia can be contracted in a few moments. Many a fine team of horses has been lost in this way up in the Yukon.

One must be careful about touching metals with unprotected hands. It is dangerous to take hold of a doorknob when it is 60° below, or thereabouts, with the unprotected hands, unless you are careful to release your hand instantly, for if you do not it will freeze your inner palm in five seconds, the result being much the same as from touching a red-hot stove. Canned goods undergo great contraction during extreme cold, and take in air; in summer, with a temperature of 90° above zero, the reverse condition prevails, causing leakage and loss.—*Evening Post*, New York.

WULFENITE is the molybdate of lead. It occurs in Arizona in large, flat, transparent crystals of a yellow color. It is commercially valuable when pure, for its molybdenum content.

BELTS should always be run with the smoothest side toward the pulley, as the smooth side gives a greater surface of contact.

A Clever Bit of Engineering.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK ALEY.

The Copper Queen smelter stack grew in height to the extent of sixty feet in less than three hours on December 26, 1906. The manner in which this was done constitutes one of the cleverest feats of construction ever undertaken in the Southwest.

The original stack was 200 ft. high by 25 ft. inside diameter. The company found it necessary to increase the height in order to get a better draft and recover more flue-dust. This undertaking would have been simple enough, except for the fact that a shut-down was not to be considered.

A contract was entered into with the Wisconsin Bridge & Iron Co. to place an extension of 60 ft. on the stack without a shut-down, except for the space of four hours. If the contractor failed to connect in four hours, he was to pay a heavy forfeit for every minute in excess thereof. If he succeeded in completing the work without a shut-down, he was to receive a liberal premium. The work was begun about four months ago. It began with the construction of false work, as shown in the accompanying photographs, constituting a network of timbers, securely bolted throughout. Fifty thousand feet of mine timber was used.

After a multitude of difficulties, arising chiefly from the disinclination of the mechanics to work so far above ground, the false work was brought up to a level with the top of the main stack. At this stage, the plan of construction revealed itself. On this false work, which was considered too weak for the undertaking by the casual observer, the 60-ft. extension was built rapidly, despite delays occasioned by the desertion of workingmen, sulphur smoke, and a score of other obstacles.

The new extension of the stack was constructed with its base in a steel truck, this truck resting on rollers or low wheels, they in turn resting on the heaviest of railroad steel. Round by round, the new section went up until it stood erect and substantial, as shown in Fig. 1. The new extension weighed approximately 60 tons, being composed of 5/16 steel. When completed, it was lightly guyed from the top of the false work and everything was in readiness for the final act. On the morning of December 26, while the people were watching a mile away for the rare event as they would watch for a total eclipse of the sun, the brief space between the new section of stack and a conspicuous timber by the side of it began to widen perceptibly. Wider and wider it grew, until the rim approached the rim of the original stack. The wind was unfavorable and billows of sulphurous smoke enveloped the workmen at times, but the new section never paused. Very soon, a part of the great volume of smoke was seen to be coming through the new section, then fully half of it, then the bulk of it, until the whole was pouring through a 260-ft., instead of a 200-ft., stack and the splendid work was accomplished in three hours. It had been done without shutting down. The engineer was J. F. Jackson, of Houghton, Michigan.

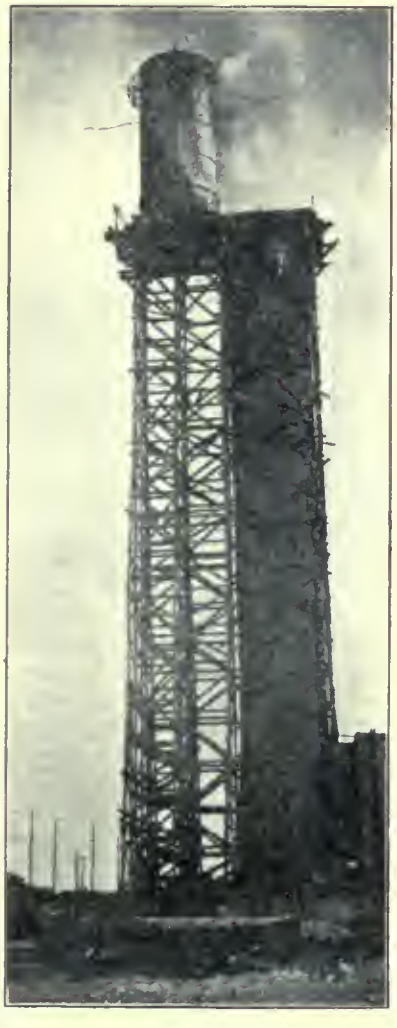


Fig. 1. The New Extension as it Appeared, Completed on the False Work.

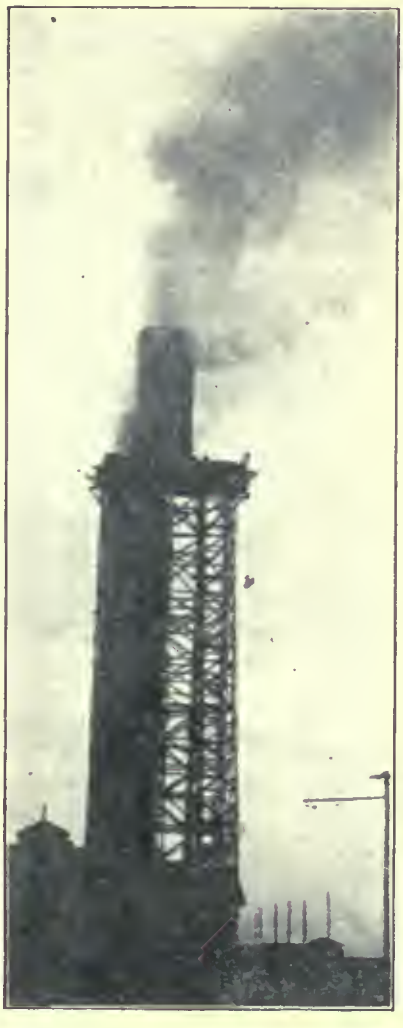


Fig. 2. The New Extension Half-way Over the Original Stack, With Smoke Coming Through Both.

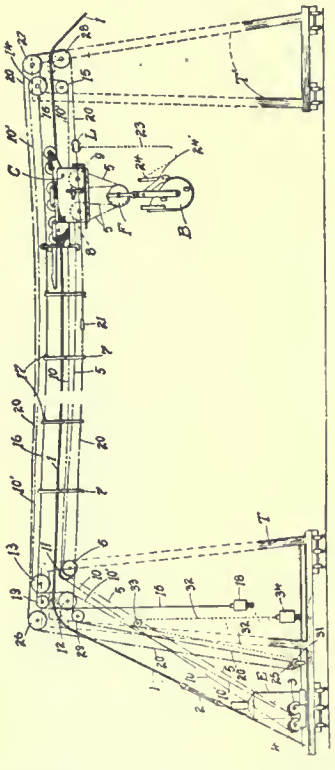
Fig. 3. The New Extension Attached to the Original Stack.

THE British Government has ceased issuing licenses for Chinese labor and the whole system of Chinese importation will cease in South Africa on July 1, 1908.

MINING AND METALLURGICAL PATENTS.

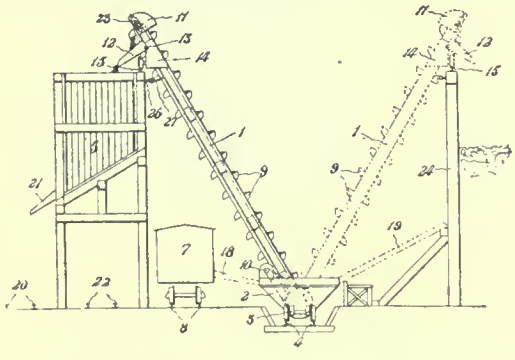
Specially reported for the MINING AND SCIENTIFIC PRESS.

CABLE CONVEYER.—No. 841,858; Ulysses A. Garred, Anaconda, Mont., assignor to Anaconda Copper Mining Co., Anaconda, Mont., a corporation of Montana.



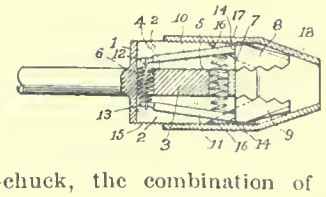
In a cable conveyer, a main cable or way, a suitable traveling carriage, a bucket suspended therefrom, and devices supported independently of the cable adjustable along the path of travel of said carriage for effecting a discharge of the bucket when the carriage has reached a given point.

TRAVELING CONVEYER-CRANE.—No. 841,712; John W. Orrock, Montreal, Quebec, Canada.



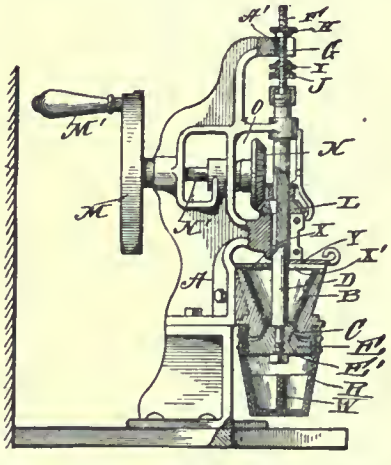
In a conveyer device, the combination with a surface track of a truck mounted thereon, a boot or hopper mounted on said truck, a mast carried by said boot, an elevated track, a carriage supporting the upper end of the mast upon said elevated track, means for delivering material into both sides of said boot or hopper, and a bucket-chain adapted to discharge said material from the upper end of the mast.

DRILL-CHUCK.—No. 841,758; Walter H. Adams, Sound Beach, Connecticut.



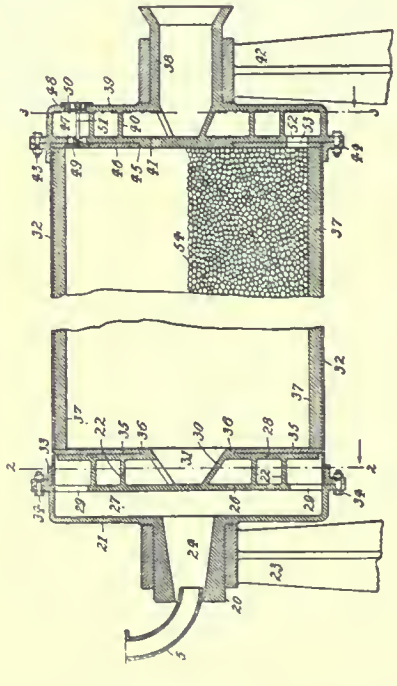
In a drill-chuck, the combination of the exteriorly threaded body having upper and lower channels, whereby a central web is formed which latter has perforations extending therethrough at the rear and front ends thereof, the coil-springs within said perforations, the jaws within said channels and comprising head and tail portions, the free ends of the tail portions being hooked within the opposite ends of the rear coil-springs, which latter have a resilient energy which tends to draw together the extreme ends of said tail portions, while the front portions of these tails are always in contact with the front coil-springs, which latter have a resilient energy that tends to spread the jaws apart, the head portions having a shoulder engagement with the chuck-body, and the interiorly threaded sleeve having a conical front end and adapted to be driven on said body.

COMBINED PULVERIZER AND SAMPLER.—No. 841,921; Oscar C. Beach and Arthur L. Buzzell, Los Angeles, Cal., assignors, by mesne assignments, to Frederick W. Braun, Los Angeles, California.



An apparatus for pulverizing and dividing frangible materials, comprising a frame having a laterally extending arm which is provided with an open slot, a stationary grinding-plate having an opening therein, a screw positioned in said slot and provided with a head at its lower end, a nut mounted upon said screw and resting upon said slotted arm, a vertically mounted shaft swiveled to said head, a grinding-plate fixed to the bottom of said shaft, and means for rotating the latter.

TUBULAR BALL-MILL.—No. 841,841; Max F. Abbé, New York, New York.

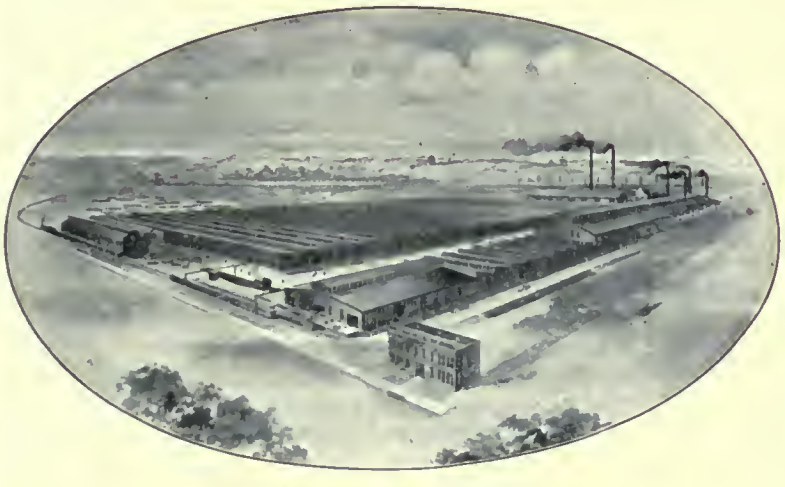


In a tubular ball-mill, a head composed of a flanged end plate, an integral hollow trunnion extending outwardly therefrom, a spiral conveyer extending inwardly therefrom, an inner plate having a beveled flange, and beveled sector-shaped liners engaging said flange.

The American Spiral Pipe Works.

For a number of years the American Spiral Pipe Works of Chicago have enjoyed a large trade in piping for long water-supply lines, hydro-electric plants, compressed air and exhaust steam mains, and the like. Their business grew to such an extent that they were compelled to look for a new and larger site, and after consideration it was decided to stay as close as possible to the centre of the city. They finally obtained four city blocks between 46th and 48th Ave., south of 14th St., where their new works have just been built, comprising a number of buildings. They have three-quarters of a mile of railroad on their grounds, connecting with the Western Indiana Belt Railroad and the Chicago Terminal Transfer Railroad, which are the two main belt lines of Chicago, either of which connects with practically every road entering the city. This is a great advantage in obtaining cars for quick shipment.

The main building, or pipe shop, of brick and mill construction, is well lighted by the saw-tooth roof. This building is devoted exclusively to the manufacture of spiral riveted pipe and heavy sheet metal work. Adjoining the pipe shop is a material shed, of steel construction, where the steel plate used in the manufacture of spiral riveted pipe is received and stored. North of the main shop are the asphalting and galvanizing plants of the testing-room so arranged that the finished product may be tested and galvanized or coated with asphaltum on its way from the shop to the shipping-room. Parallel to and 50 ft. away from the pipe shop are the forge shop, machine shop, stock-room, and shipping-room, all of brick and steel. The forge shop and shipping-room obtain light and ventilation from a monitor in the roof, and the machine shop from a saw-tooth roof similar to the main shop. The forge shop, where there are installed many heavy special machines, is devoted exclusively to the manufacture of forged and rolled steel flanges. Here large quantities of drop forgings, weighing from 100 to 400 lb. each, are handled with great ease and readiness.



The American Spiral Pipe Works.

Taking Machinery Into the Andes.

A new double-drum electrically-driven hoisting engine, built by the Lidgerwood Mfg. Co. for the Inca Mining Co., will have to travel over an interesting and complicated route before it reaches its destination beyond the summit of the Andes in Peru. The Santo Domingo mines, for which the hoist is destined, lie behind the Lake Titicaca region, where the Spanish conquerors found such store of precious metals.

These mines were discovered about twelve years ago by a couple of Peruvians who had wandered across the summit from Arequipa in search of placer gold. They found a vein of gold-bearing ore where a landslide had uncovered the rock. A year later the property was acquired by a party of men from Bradford, Pa., and the Inca Mining Co. was formed. Work was begun about eleven years ago, and more than two and a half million dollars worth of gold has been taken out up to this time. The company has about thirty miles of tunnels, shafts, and drifts opened up.

The hoist, which is now on its way, is to be placed in an adit that has been run 1,700 ft. into the mountain, cutting the vein 1,500 ft. below the outcrop. A 500-ft. shaft has been sunk from the adit, and the new hoist is to bring the ore from the lower workings to this level. Accompanying the hoist are two 200-kw. General Electric generators. These will furnish power to operate the hoist, mill, and other machinery of the mine. The mill contains 10 stamps, a concentrating and a cyaniding plant. The hoist will go by steamer to the port of Moliendo. From there a railroad will take it to the Tirapata in the Lake Titicaca region. There the Inca Mining Co. will receive it and carry it 150 miles over roads of its own building, to the mine. The first part of the way for 100 miles is over a wagon-road, which reaches to the summit of the Andes at Lake Arracoma, 16,000 ft. above the sea-level. The next 50 miles is only a mule-road. To make it possible to transport the big hoist over this part of the route it was built in sections, with no one piece weighing more than 300 lb. The total weight of the hoist is 13,800 lb. The drums are each 48 in. diam. with 40 in. faces. The hoist is designed for a duty of 3,000 lb., to be lifted at a rate of 400 ft. per min. It is driven by a 37-h.p. induction motor of the General Electric make, and operated by a 440-volt alternating current. The power-house is about a mile away from the mill. It is intended to develop about 250 h.p. at first, and this can be doubled by adding another standpipe. The mine lies at an elevation of 5,000 ft. above the sea. Beyond the mine the company has built a road about 75 miles long to the Tambopata river, where it is now putting together a little steel-hulled steamboat for navigating the Tambopata, Madre de Dias, and Beni rivers. At the crossing of the Irambari river the road is carried by a wire-rope suspension bridge 320 ft. long. Telephone lines 250 miles long, belonging to the company, connect the mines with the railroad and points where work is being prosecuted. Photographs of this region and of the road appeared in the MINING AND SCIENTIFIC PRESS of September 22, 1906.

The Insulation of Stationary Boilers.

The development in the covering of steam and fire-heated surfaces is always a subject of interest, since no question of steam-saving can be settled until the matter of proper insulation is taken into account. Some years ago the subject was of minor importance, and not until pressures began to increase, and temperatures to rise, did the subject begin to receive attention. From that time on numerous attempts to prevent radiation by means of covering were made, and although it may seem strange, stable manure was one of the first materials to be used. As the subject was given more thought, attempts were made to improve upon the materials used and for a time organic matter in the form of animal hair, commercially known as 'hair felt,' was employed. The results obtained, while distinctly better, did not solve the problem, for steam-pressures were steadily increasing and furthermore it was found that 'hair felt' became charred and lost most of its non-conducting properties soon after it had been in service. To find a material that would successfully insulate heated surfaces was therefore the problem.

After numerous experiments, it developed that asbestos, a fibrous mineral, could be used for this purpose and accordingly it was made in the form of cement and applied with a trowel. While this was a vast improvement it was found that the material contained two undesirable features. The hard and solid nature of the finished work caused it to be a poor non-conductor and the contraction and expansion of the boiler caused the covering to crack, thus destroying its efficiency. After further experimenting an asbestos 'fire felt' was manufactured. This material does not crack,

flake, or peel off. It is made of flocculent asbestos, formed into sheets and so constructed that by slightly moistening the under side of the sheet, it can be readily applied and will immediately conform to the shape of the boiler. The sheets are made three by two feet, so that there is a minimum amount of joints or cracks between them and they can be made in thicknesses varying from one to three inches. Among several other strong points in its favor is the great amount of dead-air space confined in the material itself, and because of its resilient and elastic qualities and consequent freedom from damage, when walked on, etc., it is the ideal covering for boiler tops, steam-drums, headers, and other surfaces too large to be covered with sectional covering.

The manner of application is very simple: The sheets are strapped to the surface to be covered with cable wire, and are held firmly in place with hexagonal netting. Over the surface of these sheets is applied asbestos cement or magnesia cement, both of which materials present a hard, smooth, and washable finish.

Southeastern Manchuria.

A consular report from Mukden announces the completion of the new Japanese railroad from Antung, on the Korean border, to Mukden, and the prospective industrial development of the Shenking province, through which the railroad passes. Southeastern Shenking is said to be unusually rich in minerals. The mountains contain abundant deposits of coal, iron, copper, lead, silver, and gold. The working of all these deposits has for a long time been carried on by the natives; their methods, however, are of the crudest and the output consequently small. The coal thus far unearthed has been found to be a superior grade of anthracite, and its utilization only awaits capital and the means of bringing it to the market. One of the largest beds yet discovered in this region, and till recently scarcely touched, lies near Penshihu, an important station on the Antung-Mukden railway. Its development was first undertaken by the Chinese in the latter part of 1903, with the result that some fourteen pits were opened. There is another large bed of coal at Niutan, a short distance to the southeast, where about 1,000 coolies were formerly employed in digging, most of the output being sold to the Russians. The Okuragumi, a Japanese concern, a year ago obtained permission from the Chinese Government to work a mine near Penshihu. They have hardly commenced operations, the entire output thus far not exceeding 300 tons, but intend at an early date to use some $100,000 in the construction of shafts and other improvements. The coal is said to be of the best quality, and that taken out so far has been sold to the Japanese Government for use at its iron foundries. Silver has been found chiefly at Antung and Fenghuangchen, near the Yalu river, and was at one time mined by the Chinese; but the work was abandoned owing to the large lawless element which existed among the coolies, and which made operation both unsafe and unprofitable. Thus far the iron wealth seems practically to have lain untouched by the pick. Desultory attempts have been made by the Chinese to utilize it, but the limited returns on the capital invested, the fault of crude methods, as well as the difficulty of bringing the product to market, have made it impossible for the virgin article to hold its own against the old scrap iron entering the country from Newchwang.

Commercial Paragraphs.

THE CRANE CO., of Chicago, announce that their new steel foundry is in full running order.

A. LESCHEN & SONS ROPE CO. publish a handsomely illustrated pamphlet on long distance transportation of ores by aerial wire-rope tramways.

THE BUFFALO FORGE CO., of Buffalo, New York, issue Catalogue No. 77, describing the blacksmith tools and equipment that they manufacture so successfully.

D. H. PALMER, who has been associate manager of the Denver office of FAIRBANKS, MORSE & CO., has been appointed manager of the mining machinery department of this company, with headquarters at the home office at Chicago.

THE DENVER ENGINEERING WORKS CO. has recently secured the contract for all the metal-work of the big U. S. reclamation reservoir in Arizona, in the Salt River valley. This contract consists mainly in supplying huge castings for the outlet gates and pipes.

THE importance and advancement of gas and gasoline as a motive power is indicated by the announcement of the DUBOIS IRON WORKS, DuBois, Pa., a $1,000,000 corporation, which has taken over the entire business of the Lazier Engine Mfg. Co., Buffalo, New York.

THE RISDON IRON & LOCOMOTIVE WORKS of San Francisco report having closed a contract with the Masonic Mountain Gold Mining Co. of Mono county, California, for a 10-stamp mill of the latest type with cast-steel wearing parts throughout; the power plant being large enough for an additional 10 stamps.

The largest order for gas producers ever awarded has been given to THE WELLMAN-SEAVER-MORGAN CO., of Cleveland, by the U. S. Steel Corporation, and calls for 64 Hughes mechanical gas producers for their Duquesne steel works. These producers are to be driven by electric motors, and are equal in gas producing capacity to 160 hand-poked producers. The Hughes mechanical producers attract the attention of steel makers because they require no hand-poking, give a better quality and more uniform supply of gas, and in battery require less room than the hand-poked type of producer.

Books Received.

REGISTER OF CORNELL UNIVERSITY. 1906–1907. This gives useful information concerning the teaching, faculty, and students at the University.

NEW LIGHT ON PETROLEUM OIL, by Jas. W. Wilson. This is a brochure of thirty pages devoted to an interesting account of the "plan and purpose of the oil-systems in the earth." The author is an oil geologist at 923 Stock Exchange Bdg., Chicago.

MINING LAW IN PRACTICE, by G. W. Miller. A handbook, bound in leather, of 300 pages, illustrated. It is a brief treatise on mining rights, correct methods of locating, holding, and acquiring patents to mineral land. Price, $2. For sale by the MINING AND SCIENTIFIC PRESS.

THE ASSAY OF TIN AND ANTIMONY. By L. Parry. A. R. S. M. Published by *The Mining Journal*, London. This is a small book of 50 pages, by a specialist, giving the latest methods for determining the two metals mentioned. As both of them are in demand, it is likely that the book will prove useful. Price $1.50.

THE ENGINEERING INDEX. Vol. IV. 1901–1905. This volume of 1,234 pages is the most valuable reference book of its kind, and is necessary to any mining or metallurgical library. It is published by *The Engineering Magazine*, New York, and has been compiled by the editors of that publication. Incidentally, such an index proves the advisability of giving proper titles to articles and books, so that they really indicate the subject matter.

Publications Received.

REPORT OF THE STATE GEOLOGIST, WYOMING. This includes an interesting account of the exposure of a fraudulent mining scheme and the conviction of the perpetrator.

THE WELLMAN-SEAVER-MORGAN CO., of Cleveland, issue Circular No. GP-1 on the Hughes Continuous Gas Producers. It is well illustrated with photographs and drawings.

THE UTAH MINING MACHINERY & SUPPLY CO., of Salt Lake City, issues Bulletin No. 300, describing the Callow traveling-belt screen. This pamphlet contains an excellent account of the methods of ore dressing involved in the use of this invention, as well as a description of it. The drawings and flow-sheets are numerous, and, as they represent actual milling practice, they will be found valuable to those engaged in the concentration of ore.

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Editorial.

THE RICHEST CARLOAD of ore shipped from the Mohawk mine, at Goldfield, Nevada, to the Selby smelter, contained 47 tons assaying 609 ounces of gold per ton. It had a gross value of $591,637; the express charges were $8,800, and the check paid after deducting freight and treatment, amounted to $574,000. On the other hand the thirteen cars that were valued in an Associated Press dispatch at $7,000,000 yielded only $300,000. Fact and fiction are wonderfully blended in the stories that come from Nevada, but it is apparent that the truth is gorgeous enough without further gilding.

OUR ESTEEMED CONTEMPORARY, the *Engineering News*, draws attention to the fact that the resignation of Mr. Charles D. Walcott as director of the Geological Survey to become secretary of the Smithsonian Institution tends to emphasize the absurdity of paying the executive head of a big organization, charged with the expenditure of a million and a half per annum, a salary of only $6,000, while the chief of the Smithsonian, with responsibilities only a fraction of those of the other post, is paid $7,000 per year. It is not that the latter salary is too large, for the position is one of importance, but to pay a man $6,000 for duties that in private or corporate business would entail a payment of $10,000 to $20,000 per annum, is not reasonable. However, the matter does not stop here; geologists who do some of the most important work of the Survey get salaries of $2,500 to $3,000 per annum and this is for scientific investigations for which professional men, under retainer by corporations, receive $7,500 to $10,000. No wonder that the younger members of the Survey are leaving the service of the Government. If the Survey is to maintain its authoritative position as a scientific corps, it will be necessary to have some regard for the sort of pay that equally intelligent and skillful men receive in similar occupations elsewhere.

A LARGE NUMBER of mining papers devote their reading pages to the exposure of fraudulent mining companies and sell their advertising pages to other concerns fully as bad. The inference is fairly obvious, but it is none of our business to press it home. Now, however, the possible seriousness of the situation is lightened by a stroke of humor. Someone on Wall Street has started a sheet called *The Eye-Opener*, the purpose of which, on the surface, is to pillory "the vehicles for wildcats," the names of which appear conspicuously in its issue of January 1. We think that the post-office inspectors ought to pay attention to some of the predatory literature that masquerades in the guise of the investor's friend and the simpleton's guide, but in the meanwhile a little quarreling among them may serve to throw light in

dark places. *The Eye-Opener* attacks the other fellows viciously and advertises several schemes that look no better than any other alluring short cuts to wealth. As a matter of fact, no paper that pretends to give advice on mining matters ought to receive advertisements of mining stocks, the relation between one and the other is too obviously dangerous. *The Eye-Opener* had better undergo treatment himself; his optics look yellow.

A CORRESPONDENT, who is a scientific man, sends us a good story illustrating the varied geological distribution of gold. He was in charge of gold-mining operations in New Zealand, the lode being in an Upper Silurian formation. Within half a mile there was "an old miner pounding away by himself in a tunnel" that was in a Cretaceous-Tertiary formation; this man was getting some rich specimen ore and "strangely enough he was getting coal to sharpen his tools from the same tunnel, he having cut through a small seam of lignite on his way to the lode." We remember also hearing of gold being found, on the west coast of New Zealand, in coal, where an alluvial channel transgressed a coal seam. Some of our readers may be able to contribute other instances of this kind.

Greenwater Again.

In referring again to Greenwater it is not to do that camp an injustice, but to justify a recent criticism, which certain local papers have ventured to impugu. From information just received, we learn that the generalization published in our issue of January 12 was as correct as any general statement can be. There is a good showing of oxidized ore on the surface at several places, and there is a belt extending from twenty to thirty miles that is marked by scattered occurrences of copper ore. In the Greenwater district itself there is as yet no sulphide ore, except for a little chalcocite occasionally found with the copper carbonate—an association that suggests secondary enrichment, itself not encouraging, since this ore in bulk runs less than 10 per cent. There are a number of veins, one or two feet wide, with others, on the Schwab property, that are four or five feet wide, containing ore that, after sorting, will yield some 5 to 8 per cent stuff. It is oxidized ore, and therefore not amenable to concentration. There is no ore in the camp that it will pay to ship at this time, in fact, as we said previously, there is not a carload of 10 per cent ore obtainable. There is no sulphide ore at Greenwater, but at Willow Creek, 18 miles southeast, there is pyritic ore from which some three per cent stuff can be sorted. It amounts to this, that there is a large showing of ore too low-grade to be profitable now and in quantity insufficient as yet to warrant any reduction plant. There are many good-looking prospects, but no mines. Even the Greenwater-Death Valley consolidation, known as the Schwab property, is at the best a hopeful prospect, worthy of development, but not in a condition warranting the sale of stock on the basis of a proved mine. About $3,000,000 has been taken from the public in the name of Greenwater; the fact is, the camp warrants the expenditure of $250,000 in legitimate prospecting; it does not justify the selling of a single share to the public until a thorough test has been made by means of intelligent exploratory work. What reputable mining engineer has reported favorably on the prospects at Greenwater?

Alluvial Mining in California.

The growth of dredging has redeemed alluvial mining in California from a serious decline, for the exploitation of gravel deposits has quite lost its former position of importance. Lode mining for gold and copper has grown to dimensions unexpected at the time when the cream of the placers was gathered during the days of the pioneers, when man had but to help himself to the results of a natural concentration of gold that had been going on for a time longer than human history. The figures for 1906 are not yet available, but those for 1905 show that in that year there were 658 alluvial mines in the State; the distribution of these and their respective yield of gold is shown thus:

	Number	Output	
		1904	1905
Hydraulic mines	227	$1,028,183	$975,140
Dredging companies	26	2,187,040	3,276,143
Drift mines	119	933,954	815,242
Surface placers	286	836,125	825,555
Total	658	$4,985,302	$5,892,080

Thus there was an increase of $906,778, which would have been a decrease of $182,314, had it not been for the gain by dredging. California yielded $19,197,100 in gold during 1905, so that alluvial mining was accountable for only 30 per cent and hydraulic mining for only 5 per cent of the total yield.

Trinity county is first in hydraulic mining, having yielded $370,034 by this method; Siskiyou is second, with $228,291. No other single county in the State gave an output of $100,000 from hydraulic mines during the year. Trinity and Siskiyou are both on the watershed of non-navigable streams and therefore unhindered by the debris problems that have almost made an end of hydraulic mining along the watersheds of the Sacramento and San Joaquin rivers. That region did not yield $500,000 from hydraulic mines. According to the report of the Debris Commission for the year ending June 30, 1906, the total quantity of material mined under permits during twelve months was only 750,000 cubic yards.

Dredging is prospering. In 1905 the yield came mostly from Butte county, to which belongs Oroville. The accompanying figures speak for themselves:

County.	1904	1905	Increase or Decrease.
Butte	$1,632,507	$2,261,888	+$629,381
Calaveras	115,951	202,505	+86,554
Sacramento	348,990	610,672	+261,682
Siskiyou	6,827	7,111	+284
Trinity	8,500	5,000	—3,500
Yuba	74,263	188,967	+114,704
	$2,187,038	$3,276,143	+$1,089,105

In 1906 there was a further increase of at least $500,000. In Yuba county the number of dredges increased from two to ten, although some of these started late in the year. In the Folsom district also there was greater activity, and at Oroville the production has been well maintained. This branch of gold mining will soon be contributing $5,000,000 per annum. It represents a form of industry that affords the basis for sane speculation.

By the Way.

In a recent issue of the *Electrochemical & Metallurgical Industry*, there appears an interesting essay by Mr. Joseph W. Richards, professor of metallurgy in Lehigh University. His subject is 'Rule of Thumb vs. Engineering.' The professor says:

The 'engineer' is one who strives to perfect his work, the 'artisan' works to get through with it; the first labors for intelligent love of his work, the latter "quits when the whistle blows;" the first puts "gray matter" into his labor, the latter only muscle and experience.

Ever since man emerged from pre-historic savagery, the one who weighed chances, measured his resources, and ordered his actions by intelligent foresight, has earned the place and deserved the title of "the fittest." Engaged as we all are in receiving impressions, recording observations, gaining experience, that man alone is wise who profits by this information to lay down rules for the guidance of his future conduct, for the ordering of his future actions.

The English definition of an inch is that it is "the 12th part of a foot, and equal to three barleycorns." The foot was, of course, originally the average length of the pedal extremities of a race of people and it was not only natural, but inevitable that, for example, the French foot should differ in length from the German foot, etc., etc. Not wishing to pursue this branch of our inquiry to too great and perhaps tiresome lengths, we may as well recite at once a striking and suggestive fact, whose connection with our argument may not be at once apparent, namely, the French word for an inch is *pouce*, which is also French for the thumb. The connection implied is, of course, that an inch, in France, at least, and probably in England also, was originally the length of the second joint of the thumb, which varies less in different people than would at first thought be imagined.

In the absence, therefore, of a proper foot rule marked into inches and fractions, it was customary at one time to measure lengths of small dimensions with the thumb joint, and so get an approximation of the number of 'thumbs' in a given length. It would be ill-advised, if not conceited, for us to poke fun at or wax sarcastic about the absurdity of such practice, for the 'rule of thumb' was a valuable practice when compared with what it displaced—no rule at all; and just as imperfect laws are better than total lawlessness, so the 'thumb rule' marked a decided advance toward the arts and sciences.

Somewhere later in time than the period we have been considering, measures of length accurately compared with an arbitrary standard began to multiply and to displace the 'rule of thumb.' Artisans could then begin to work with exactness, the carpenter could plan and scheme ahead accurately by measure, the smith could forge articles to any required stated size, the gentleman could order from his tailor trousers so many inches long, without allowing for the different lengths of thumb of his sartorial 'churls.' This period having arrived, and this stage of advancement in the arts and sciences having been reached, we are now prepared to let loose the vials of our criticism, or, perhaps, indignation, and with perfect justification, upon the unlucky wight, who, either from inborn 'cussedness' or acquired laziness *continues* to afflict humanity with 'the rule of thumb.' Here is the unpordonable sin; the accurately divided rule has come, and the confirmed sinner sticks to his 'thumbs' and 'barleycorns.'

Having dragged the reader through this somewhat misty prologue, it is becoming that we state exactly what we mean to preach further about. It is just this: The difference between 'rule of thumb' and accurate calculation, the wide gulf separating the hit-or-miss cut-and-try methods of the ancients and the scientifically informed practice of the modern technologist. Not that we are going to hold up the former to ridicule or the latter to extravagant adulation, but we wish to discuss some of the features of modern technology which illustrate the great change which has taken place and the still greater changes which are possible.

To take an illustration from civil engineering: Spanning the Firth of Forth, a few miles above Edinburgh, stands the greatest structure of the present time. With clear spans of 1,700 ft., capable of carrying the heaviest trains, the strains and stresses in each of its thousands of members all accurately calculated beforehand, here is a monument to engineering skill absolutely unthinkable as a product of 'rule of thumb.'

Look once more at the electrical engineer and his achievements. A huge dynamo spins like a top on a shaft 160 ft. deep, and develops in the smallest compass imaginable 10,000 h.p. The diameters of the armature wires are accurate to the thousandth of an inch, the hundreds of turns of wire are neither one too few nor one too many, the very phases of the pulsations of the electric waves are mapped and studied out so as to bring out the maximum efficiency. Soft iron from Norway, mica from Canada, rubber from Paraguay, copper from Arizona, shellac from China, steel from Pennsylvania, are combined with the most consummate skill and accurate calculation into a huge giant, which works day and night with almost the regularity of a planet. 'Rule of thumb' could never have conceived of such a product; only 'engineering skill' has made it possible.

One art and one science still bear much of the stigma of 'rule of thumb;" the science of chemistry and the art of metallurgy. Chemistry remained alchemy until the invigorating breath of modern methods commenced to blow away the mists of mystery which enveloped it. The evolution has been long and laborious. Conservatism in the manager combined with stubborn old-fogyism in the workman, have conspired against enlightening methods to keep the industry in the rule-of-thumb rut. Germany was the first country to break away into scientific and engineering chemistry, and the lead thus gained has been maintained to this day. The Britisher, workman or manager, is the most conservative of human beings, and his backwardness in following Germany's methods is the chief cause of the industrial difficulties under which the British chemical industry now labors. Metallurgy is still rule of thumb in many countries, such as Central Africa (production of iron), China (production of lead and mercury), Straights Settlements (reduction of tin), where aboriginal methods still largely survive. But, the aboriginal spirit is preserved in many other so-called civilized countries; it persists among the Cornish and Saxon tin workmen, the Derbyshire and Carinthian lead smelters, the Welsh and Mansfield copper refiners, the Alaskan and Siberian gold winners, the Missouri and the Silesian zinc distillers, the Almaden and Idrian mercury mines, the eastern Peunsylvania as well as the Lithuanian blast-furnaces.

Among all of these, and others too numerous to mention, are to be found that reverence of tradition, that willingness to keep plodding in the rut, that indisposition to apply the discoveries of modern science, that ignorance of what modern science has disclosed, which keep them groping in the semi-darkness of medievalism, while their more intelligent neighbors are running away from them like an express train distancing a stage-coach.

Personal.

F. L. Bosqui is at Tonopah.

J. Parke Channing is at Salt Lake.

Foster Hewett is examining mines in Jalisco, Mexico.

R. H. Channing is in New York. He leaves shortly for Peru.

Courtenay De Kalb is inspecting dredging ground at Oroville.

F. F. Sharpless recently examined the Emma mine, in Colorado.

Forbes Rickard has been examining mines at Butte, Montana.

John Hays Hammond has gone, for his health, to Bermuda.

A. A. Blow recently gave an address at the Columbia School of Mines.

F. N. Fletcher, of Berkeley, has returned from Greenwater, California.

Carl A. Allen is inspecting mining territory near Choix, in Mexico.

L. H. Carver, of Oakland, has gone to Mexico to be absent about three weeks.

Laurence Pitblado has left London for Australia on a tour of professional work.

F. J. H. Merrill is at Nogales, Arizona, where he will remain for several months.

Hudson H. Nicholson, of Chicago, has been examining mines at Goldfield, Nevada.

L. F. S. Holland is re-opening the old Evangeline mine in Halifax county, Nova Scotia.

S. S. Raymond is the new manager of the Brittania smelter at Crofton, Vancouver Island.

Paul Johnson is manager of the Hadley smelter, for the Alaska Smelting & Refining Company.

Grant A. Miller has returned to New York from doing cyanide work in Chihuahua, Mexico.

Chester F. Lee, of Seattle, has inspected the Alaska-Perseverance mine, near Juneau, Alaska.

J. B. Risque, the new general manager for the Utah Copper Co., has assumed his new duties at Salt Lake.

Rupert C. Alabaster has been appointed manager for the Queensland Exploration Co., at Cloncurry, Queensland.

Edgar Collins has resigned as manager of the Combination mine, Goldfield, to take charge of the Montana Tonopah.

D. A. McDonald, dredge-master for the Reliance Dredging Co., of Breckenridge, has returned to that place from California.

R. Gilman Brown has taken up residence at London. He has gone on a visit of inspection to Chile, expecting to return in May.

Martin J. Heller, in conjunction with the changes in the Nipissing board of directors, has resigned as consulting engineer for that company.

George W. Myers has returned to Berkeley from a trip through Arizona and southern California, in course of which he visited the important mining centres.

Walter L. Ehrich is superintendent for the Bonanza Belt Copper Co., which has recently taken over the Peabody mine at Johnson, Cochise county, Arizona.

Samuel W. Osgood, consulting mining engineer, First National Bank Bdg., Chicago, recently examined property of the Pittsburgh Montana Copper Co. near Butte, Montana.

H. R. Plate has resigned the management of the Nevada United Mines Co. and for the next few months will remain at Ely, Nevada. Mr. Plate will resume his professional practice, which he had practically discontinued during his term of office with the above company, and will be pleased to examine and report upon properties in the Ely district.

Charles W. Saxman, former manager of the Keystone Coal & Coke Co., with headquarters at Pittsburg, Pa., has been appointed general manager for the mining interests operated under the control of Capt. Henry Stern and associates of New York. This includes the Yampa mine and smelter at Bingham, Utah, and the Britannia mine and smelter in British Columbia.

Trade Treatises.

The C. L. Hathaway Rock Crusher Co. has published Catalogue No. 1, describing their well-known gyratory crusher.

The Ingersoll-Rand Co., of New York, issues an attractive pamphlet describing the Davis calyx diamondless core-drill.

Jenkins Bros., of New York and Chicago, issue a handsome catalogue describing and illustrating the valves, packing, and discs that they manufacture so successfully.

The Atlas Engine Works, of Indianapolis, publish Bulletin No. 134, describing the various types of steam-engines and boilers built at this important establishment.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, February 14.

Brunswick	$0.50	Argonaut	$4.75
Con. Virginia	0.98	Savage	0.88
Mexican	0.96	Sierra Nevada	0.61
Ophir	2.58	Yellow Jacket	0.85
Belmont	5.60	Montana	3.90
Jim Butler	1.13	Mohawk	16.62
Jumbo	4.00	Red Top	3.75
Jumping Jack	0.31	Sandstorm	0.74
Manhattan Con	0.90	Silver Pick	1.45
Midway	2.10	Tonopah Ex	5.00

METAL PRICES.
By wire from New York.

	Average prices for week ending February 7.	Average prices for week ending February 14.
Copper—Lake (cents per lb)	25 @25⅜	25 @25½
" Electrolytic "	24.70@25	24¾ @25
" Casting "	24.25@24.50	24¼ @24½
Lead "	6	6
Spelter "	6.70@ 6.75	6.75 @ 6.80
Silver (cents per oz.)	68½	68¼

ANGLO-AMERICAN SHARES.
Cabled from London.

	February 7. £ s. d.	February 14. £ s. d.
Camp Bird	1 7 6	1 7 9
El Oro	1 5 0	1 10 0
Esperanza	2 9 6	2 14 6
Dolores	1 11 6	1 12 6
Oroville Dredging	1 0 3	1 0 0
Stratton's Independence	0 3 0	0 3 0
Tomboy	2 4 6	2 1 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Feb. 7.	Feb. 14.
Bingham Central	1½	1½
Boston Copper	30½	30¾
Calumet & Arizona	193½	192½
Cumberland Ely	12	11⅝
Dolores	8¼	8¾
El Rayo	6¼	5⅞
Guanajuato Con	4¾	4⅝
Giroux Con	9¾	10⅜
Greene Con	31½	32
Nevada Con	17⅛	17¾
Nipissing	11⅞	13
Tennessee Copper	46¼	49⅞
Tonopah Ex	4⅞	5⅛
Tonopah-Belmont	5¾	5¾
Tonopah	17¾	17½
United Copper	71½	73¾
Utah Copper	36½	38⅛

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Mining Summary.

ALASKA.

NOME.

Boilers and prospecting outfits have recently left Nome for Center creek; the Good Hope property on Irene creek; for the Daniels-Seward property at Bluff, for Arctic creek; and many other points, showing a wholesome activity in the hills. ——Warnings have been issued relative to the stampede to the Chandelar district. No one, it is stated, should go into that country without an outfit. There is no store nearer to the diggings than Coldfoot, which is 65 miles distant, and the only other outfit-stations are Circle; Fort Yukon, which is 162 miles away; and Bettles, 130 miles distant. The strike on the Chandelar seems to be of a substantial character. The principal finds are between the north and middle forks, and on Squaw, Little Squaw, and Big creeks. The gold is in the gravel, and rather deep. The Myrtle creek diggings were deserted in the rush to Chandelar.——The Omilak silver mines have several shafts about 60 ft. deep. The ore carries gold and lead, but silver is the principal metal. These mines have been working continuously for several years, but shipping charges are so high that no great profits have been realized.

ARIZONA.

COCHISE COUNTY.

The Shattuck-Arizona company at Bisbee is working 350 men on its property, and is shipping over 300 tons per day to the Copper Queen smelter at Douglas. Mining is now confined principally to the 700 and 800-ft. levels, but the shaft will soon be down to the 900 level.——At the Calumet & Arizona, there are four connecting drifts between the Irish Mag and the Oliver shafts, a distance of 1,900 ft. These connecting drifts are on the 850, 950, 1,150, and 1,250 levels. A new strike is reported on the Buckeye claim of this company, to the south of the Oliver shaft. The ore discovered is an oxide and sulphide, but it will not be stoped at this time, and work will be confined to development.——The Bisbee Extension Development Co., was recently formed here to work a group of claims over the divide, west of the city. The capitalization is 40,000 shares of $10 each. F. L. Harrington is president. The 21 claims of the group are situated about 10 miles from Bisbee.——Official announcement has been made of the apportionment of shares in the new mining company which has been formed to take over the Denn-Arizona Development Co. Three and one-third shares of the new stock will be issued for one of the old, with the privilege of subscribing for one and one-third shares of the new, at the par value of $10.——On account of the cave-in at the Holbrook shaft, the Spray shaft of the Copper Queen Co. is kept very busy. A new 150-h.p. marine boiler will be installed at this shaft. The Holbrook is again in good repair and will be started at once.——The shaft of the Pittsburg & Duluth is not working, and ore from this mine is handled through the Lake Superior & Pittsburg shaft.——The American-Saginaw shaft is down 960 ft. Driving was commenced on the 870 level, and has continued 1,600 ft. toward the Dean property.——The main shaft of the Tombstone Consolidated Co. is now down 1,020 ft., a gain in depth of about 200 ft. in the last two years. The company continues to ship some ore, although the water problem is a serious one and pumping operations very expensive. This is one of the chief properties in the Tombstone district, and it is hoped that it will become a large producer. Many of the old stopes contain low-grade ore which was used for filling, when the property was originally operated, and this material furnishes the bulk of the ore now mined. J. H. Macia is in charge of all mining operations.——A new boiler and hoist is being installed at the Herschel mine in this county. The shaft is down 350 ft. and will be sunk to the 600-ft. level at once. The mine was worked as early as 1880, and although the vein is small, its values are good and have proved continuous. About two carloads of ore per month are shipped to the El Paso smelter.——Steady work is reported in the Dragoon Mtn. The Peabody will have a new hoist, and it is expected to ship 100 tons per day.

YAVAPAI COUNTY.

(Special Correspondence).—Sinking in the working shaft of the Gazelle mine, at Crown King, now down 200 ft., has been discontinued for the present. At the bottom of the shaft the vein was cross-cut and was found to be almost 40 ft. wide. A drift is being run to the north to get under the ore-shoot, which outcrops at the surface about 150 ft. north of the shaft. G. F. Harrington has taken charge of the Gazelle mine.—— The Consolidated Union-Grand Copper Co., at Silver Mtn., has been closed temporarily. The company expects to build a wagon road from Harrington to its property, and will then put in heavier machinery.——While doing assessment work on the Enid group of claims a nice body of gold-bearing zinc and copper ore was unearthed. The Enid group lies on the War Eagle vein, to the north of the Gladiator, and just west of the new strike on the Gold King. Bernard Cunniff, from Prescott, is at the Savoy camp, arranging for the development of the property. A carload of ore was shipped to the Humboldt smelter this week.—— The construction of a stamp-mill and extensive development of the Winifred group of claims, near Wickenburg, will be commenced soon. James Boyd is owner of the property, and James E. Boyd, of Nevada, will direct the work.—— O. A. Pease, from the Quartzite district, says there is great activity in that part of the country. There are about 400 men at work.

Map of Arizona.

CALIFORNIA.

ELDORADO COUNTY.

The old Excelsior mine is the centre of interest in the vicinity of Placerville. There are over 6,000 ft. of drifts and cross-cuts, and the main tunnel is in 3,000 ft., and a good body of pay-gravel has been opened. Fifteen men are employed, and a 10-stamp mill has just been completed on the property.

NEVADA COUNTY.

Operations have commenced at the McPherran mine, near Graniteville. This property was recently bonded, and a new tunnel will be run under the Bloomfield ditch, which will cut the lode at a good depth.—— The Round Mountain Champion mine will soon be worked again. A part interest in this property, near Selby Flat, was recently sold to H. Goering and W. L. Clark.—— Two loads of ore from the Chicago mine on Gold Flat were hauled to the Pioneer Reduction works.—— The Cornish pump at the Niagara mine, at Grass Valley, has been started, and the lower levels will soon be unwatered. A good strike was made in the east drift at a distance of 300 ft. from the shaft. A

Phoenix, Feb. 11.

15-stamp mill at the property is in good order.—— A shoot of good antimony ore has been encountered in the south drift of the Tightner mine, about 100 ft. from the shaft. Three shifts are working on the lower tunnel, and 300 ft. has been driven in the last four months.——A vein has been cut in the tunnel of the Giant King mine, near Washington. The upper tunnel is in 570 ft., and good milling ore has been cut. The company expects to erect a 20-stamp mill soon.

PLACER COUNTY.

The big arastras at Bunts cañon, near Colfax, are working steadily.——It is reported that the old Crater mine will be pumped out. No work has been done on this property for 20 years.——At the Three Star mine, the shaft is down 1,100 ft., and about 35 men are employed. A 20-stamp mill is on the property, and 10 stamps are run continuously.

The Bellevue mine, near Ophir, has been sold to W. F. Briee, of Los Angeles. This is one of the oldest mines in the district, and the shaft is down 300 ft., and will be sunk farther at once. None of the eastern Ophir shafts are down lower than 800 ft. The purchasers are negotiating the purchase of the Eclipse, Morning Star, and Gold Blossom properties.——The Gold Run Gravel Mine Co. is putting in new compressors .and other improvements.——Two shifts are working at the White Oak, and are making about 25 ft. per week.

SHASTA COUNTY.

Three carloads of chromite ore have been shipped from the Shasta County mine, at the base of Castle Crags. The demand is limited for this class of material, which has netted the owners $15 per ton.——A carload of machinery has arrived at Redding, for the Midas mine in Harrison gulch. The shipment includes a hoisting equipment for the new shaft.

SISKIYOU COUNTY.

There is an abundance of water for the Horse Creek hydraulic mine, near Oak Bar.—— The Poverty Point mine on Klamath river will be worked in the spring.—— The Morrison & Carlock quartz mine in Quartz valley employs a large force of men, and the prospects are promising.—— A new company has taken over the old Rusby mine and mill on Deadwood creek. The mill will be started at once.—— Holt & Gregg have a contract to ship a carload of limestone per day to the Keswick smelter.

TUOLUMNE COUNTY.

(Special Correspondence).— Unwatering of the Santa Ysabel mine, situated near Jamestown, will be commenced shortly, and it is understood that extensive development is contemplated. B. C. Austin, formerly superintendent of the Oneida mine, in Amador county, has been employed to act in the same capacity at the Santa Ysabel.——Operations have been temporarily discontinued at the Patterson mine, near Tuttletown. At the bottom of the winze the vein is three feet wide, all good milling ore.——The Bourben mine, consisting of five claims, and situated between Knights creek and the Stanislaus river, was last week purchased by W. E. Mitehell, of New York. Development work will be continued on an extensive scale.

An Eastern syndicate is investigating the Draper mine, near Soulsbyville, with a view to purchasing the property.—— At the Jumper mine, near Stent, 45 men are employed and 20 stamps are dropping, and at the Shawmut, at Jacksonville, 170 men are employed, and at least 30 more will be added to the force within the next few weeks.

Tuolumne, Feb. 11.

YUBA COUNTY.

P. J. Williams has been elected president of The Marysville Tunnel & Quartz Mining Co. This company owns claims at the Narrows, on the Yuba river. The original plan of draining the bed of the river has been abandoned, and excavating machinery will be installed.——The Pacific Gold Dredging Co., which owns the dredging rights on 13,000 ft. of the Sacramento river, between Keswick and Coram, has been organized, with a capital of $500,000. It will construct a suction dredge, which will be completed by spring.

A 400-acre plat, belonging to N. F. Mahle, in the vicinity of Honcut, has been bonded to parties that intend to build two dredges to work the property.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The sale of the Arapahoe group of claims, in East Argentine, is reported. The property was purchased by English capitalists for $58,000. A company is being organized and active development will shortly follow. This property has produced ore which milled as high as 500 oz. gold and 4,000 oz. silver per ton. Carsen & Swanton have secured a group of 15 claims, situated on Payne's peak. An adit is being driven to intersect the entire group at good depth. Ore has been exposed and shipments should soon start. The holdings lie to the west of the Vidler tunnel. The Mazeppa group of five claims has been sold to M. Jacoby of Duluth for $4,000. The claims are on Democrat Mtn., and are surrounded by a number of producers. Driving is being done on the Mazeppa lode, intersected at a distance of 475 ft. from the portal of the adit, and the ore measures six feet across, with an average value of from $12 to $14 per ton, silver.——A heavy tonnage of ore is being extracted in the Bellevue-Hudson, situated on Columbian Mtn. The lessees, A. D. Bryan & Co., are shipping one carload per week, which returns 225 oz. silver per ton. Hancock Bros. have one of the rich leases of the district. They are working on the west Phillips drift, owned by the Dives-Pelican & Seven-Thirty Mining Co., and are stoping on a two-foot body of $60 silver-lead ore. A portion of the product is shipped to the Newton mill at Idaho Springs for concentration. The Jewell M. M. & L. Co. employ a force of men in the construction of the new 50-ton concentrator. The building has been enclosed and the machinery is being delivered. This plant is to be run on dump-material from the Frostberg and Mendota mines, situated on Sherman Mtn. The aerial tramway running to the railroad will be put in use, the terminus having been changed so that the ore can be dumped direct into the mill bins.——B. J. O'Connell, leasing on the Frostberg, through the Victoria tunnel, is mining 100 tons per week. The ore contains lead and zinc, and is worth $40 per ton. It is concentrated.—John Schuler has a rich block of ground on the Bismark vein. He is working through the Hercules tunnel and has a one-foot body of ore which averages $100 per ton. Riley & Roehrl have broken into a three-foot body of 600-oz. ore in the Sunburst. A blind drift is now being driven and as soon as the ground has been opened for 80 ft., the stope will again be carried. These lessees are at work 600 ft. from the portal of the adit and have a block of ground 100 ft. in length by 70 ft. in height. Pat Walsh, operating the Little Emma under bond and lease is mining 175-oz. silver ore. The discovery was made in running an adit under the upper workings, which produced $350,000 a number of years ago.——A big strike has been made in the upper Paymaster workings, owned by the Waldorf company. The orebody measures from 18 in. to two feet in thickness and the ground has been opened for 120 ft. The ore runs $90 per ton in gold, silver, and lead. Coggswell Bros. have this property under lease. Another strike in the same company's holdings has been made on the Commonwealth vein, intersected through the Wilcox tunnel workings at a distance of 3,750 ft. from the portal. Drifts have been run for 700 ft. east and west and the orebody measures from two to six feet in width, containing values in gold, silver, copper, and lead of $90 per ton. This is the most important strike made in recent years in East Argentine.——The 75-ton concentrating plant of the Transcontinental Transportation & Mining Co., is running at its full capacity. The plant is supplied from the Flossie lode, intersected at a distance of 1,000 ft. from the portal of the Vidler tunnel. Shipments will start as soon as the Argentine Central railroad is open.——Another strike is reported from the Ramsdell. In running the west drift a body of ore measuring 10 ft. in width has been exposed and a sample gave the following results: Gold, 31.41 oz., silver, 23.6 oz. per ton, and lead, 14%. Shipments are to be made direct to the Denver smelters. G. W. Teagarden announces that the working force will be increased at once.

Georgetown, Feb. 8.

The Newhouse tunnel is now in 17,477 ft., having been advanced 195 ft. during the month of January. It is announced that driving in the breast will be discontinued for

an indefinite period, which decision is supposed to be due to the lack of co-operation by the mine-owners benefited by the tunnel. A number of veins have been encountered in the last half-mile of driving, but they have all been low-grade, running from $3.50 to $11 per ton.

SUMMIT COUNTY.

(Special Correspondence).—A shipment of a carload of rich lead carbonate ore has just been made from the Dunkin property from a lease held by Knorr, Kistler & Co. This property was one of the rich mines in the early history of Breckenridge.——The New York group of claims on Gibson hill is being worked by a company and a trial shipment of a complex lead-zinc-iron-sulphide ore was sent to the sampler this week to ascertain how the product can best be treated.——As long as the Colorado & Southern Railway Co. can supply the cars, the Wellington Co. can ship 75 or 80 tons per day. The ore is high-grade zinc, and goes to the Colorado Zinc Co.'s plant in Denver. Shortage of cars is the only drawback at present.——The Senator mine has 20 miners taking out ore to ship when the roads open in the spring.——The Abundance M. & M. Co. will hold its annual meeting in Kansas City this week. S. B. Prevost is the president.——H. T. Keltie, president of the Washington Joliet company, is at the mine with W. R. Everett, of Chicago, who is considering the purchase of the property. F. H. Summeril, of Denver, is making the examination for the Chicago people.——The Sundown Placer property is being put into shape for work this year. It is situated in Illinois gulch and is owned by Wm. Squires and associates. Prospecting has shown placer gold to exist in paying quantities.——D. A. McDonald, of the Reliance Dredging Co., has returned to Breckenridge and commenced repairing the dredgeboat on the French Creek property. It is likely that the steam-power plant will be replaced by electric power. ——The Gibson Hill Mining Co. is a new incorporation of a group of properties on Gibson hill. The incorporators are B. W. Newcomb, O. W. Pitcher, Geo. Kellog, and W. F. Forman. The authorized capital is $300,000.——The Kimberly Consolidated, at Kokomo, is employing 80 men on the construction of its new mill for treatment of lead-zinc ores. This property can produce plenty of ore for the new plant to work on.——The Rothschild mine, at Rathbone, made a shipment of a carload of high-grade silver ore this week. This ore was obtained from the main tunnel workings in Cooper Mtn. Thos. Webb is the superintendent.——The Hibbs M. & M. Co. is operating the Victoria mine on Mt. Royal, at Frisco, and is employing three shifts of men in sinking the main shaft. A good streak of ore has been cut in the shaft. J. Percy Hart is in charge of the work.

Breckenridge, Feb. 4.

IDAHO.

OWYHEE COUNTY.

The new filter-presses that have been installed in the DeLamar mill are working satisfactorily, and the property is now running on a paying basis. The supply of fuel is very short, however, and the property may have to shut down again before spring, and wait for warm weather, when the mill can be run by water-power.——The new machinery for the Potosi mine has arrived and is being put in place. In the meantime work has been suspended in the mine with the exception of the cross-cut from the No. 2 level north to cut under the old Knickerbocker shaft. The new electrically driven air-compressor will soon be working, when a full force of men will be used again in the mine.

SHOSHONE COUNTY.

(Special Correspondence).—The Idaho Northern Railroad Co. was organized several months ago to construct a railroad from Enaville, a point on the line of the Oregon Railroad & Navigation Co., up the north fork of the Coeur d'Alene river to the mouth of Prichard creek, thence up the latter creek by way of Murray to the vicinity of the Bear Top, Monarch, Paragon, and Chicago-London mines. The length of the line will be 33 miles. Surveys have been made, the enterprise has been financed and plans contemplate the building of the road this year. B. F. O'Neil, of the State Bank of Commerce, of Wallace, is president, and E. P. Spalding, manager of the Monarch Mining Co., is vice-president. The development of the mines in the Murray district has made such a road a necessity and an attractive enterprise.——The Monarch group is situated on the south side of Prichard creek, five miles east of Murray. Its holdings extend from the bottom of this creek over a mountain spur and down 1,000 ft. on the southern slope. The first development was through levels from the latter side. Later a 3,300-ft. cross-cut was driven from the Prichard creek side, cutting three veins, on which a considerable amount of driving has been done. This cross-cut intersects the vein system 800 ft. vertically below the upper workings. Several cars of ore were shipped which ran 65 to 72% lead and 12 oz. silver. The gangue is quartz and the country is quartzite and slate, being similar to the Burke formation. A 75-ton concentrator has been built at the portal of the main cross-cut. The capacity of this may be increased later.——The Terrible-Edith, developed by Wash. Snyder and others, has been bonded to Butte parties. This is in a good grade of silver-lead ore and a cross-cut is being driven to obtain 400 ft. greater depth.——The Chicago-London and Paragon, managed by L. W. Stedman, have been persistently developed for several years. A compressor plant and saw-mill have been installed and good buildings have been erected.——The Bear Top mine, which is well developed, is driving a long cross-cut to obtain 439 ft. greater depth. The mill is operating with a capacity of 150 tons per day. George J. Kiebler is the new manager. The Orofino and Great Western groups are bonded to Missoula people, who are developing.——The Golden Chist, a gold property near Murray, is now in charge of Herbert S. Auerbach, of Salt Lake, who is driving a lower cross-cut and is preparing to start the mill in operation again. It is estimated that 250 men are employed in Murray district, practically all on development.

Wallace, Feb. 5.

NEVADA.

NYE COUNTY.

(Special Correspondence).—The weather conditions have improved, freight and supplies are arriving, and automobile travel has been resumed.——In the Mustang, a cross-cut has been started from the drift on the 210-ft. level. The recently opened vein on this level is four feet wide. The company contemplates sinking on the Buyo claim, near the Chipmunk.—— Work has been resumed on all the local properties controlled by the Sullivan Trust Co. On the Stray Dog sulphides have been encountered at a depth of 165 ft.—— The lode is four feet between the walls and pans free gold.—— On the Carson, a 700-ft. tunnel is to be run from near the Tonopah road. The shaft is down 175 ft.—— The Santa Lola ground is being opened by a cross-cut tunnel which is now in 360 ft.—— A four-foot vein averaging $4 per ton is being developed at a depth of 90 ft. on the property of the Manhattan High Grade Mining Co.—— The Whale shaft is down 115 ft., and at this depth a cross-cut has been run 180 ft. toward the Stray Dog.——Recent measurements of the ore-dumps on leases 9, 10, 11, 12, and 13 on the Union No. 9 claim, and on lease 13 on the Little Grey, show 4,000 tons of ore, which is reported to average $33 per ton. On the Union No. 9 there is a dump at lease No. 3. Ore has been shipped from these leases and the dumps represent the milling ore.—— Several properties have changed hands at Superior. The Nevada Superior Con. Copper Co. has let a contract for a 100-ft. shaft.

Manhattan, Feb. 8.

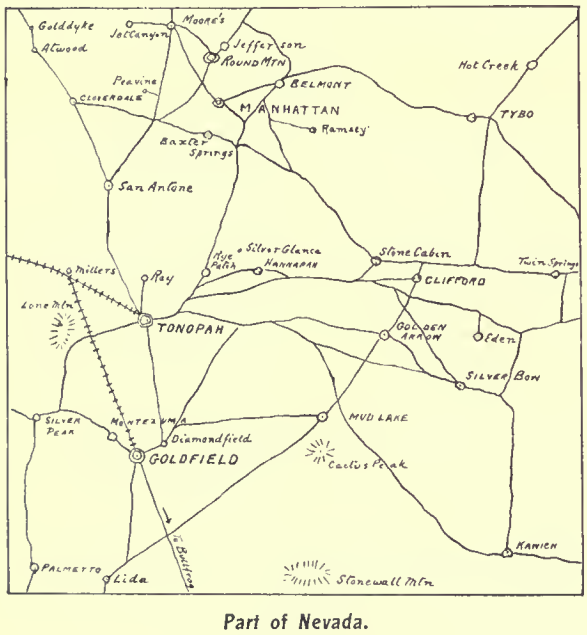
LINCOLN COUNTY.

(Special Correspondence).—F. J. Spare, the superintendent of the Pompeii and Lee Roy mines, has let a contract on the Lee Roy, and has a force of men building a headframe at the new shaft. The machinery for the mine is now on the ground.——The Philadelphia Searchlight Gold & Copper Co. has opened a vein on its property at McGahn camp, and a sample taken across 15 ft. gave returns of $17 per ton. Geo. P. Spittall, the agent for the company, has ordered a carload of machinery and building material from Los Angeles.——G. F. Coleman, the manager of the Duplex mine, is making preparations to sink 1,000 ft. on the New Years Gift. The shaft on this claim is now 260 ft. deep and is equipped with a small hoist, which will be replaced with heavier machinery.——On the Wyoming Searchlight the

development of the past week has shown that the orebody is holding well. A short drift has been cut through the ore, but it was found that the supposed wall was only a horse in the vein and back of it the drift opened up four more feet of good ore. The shaft has now reached the 300-ft. level and Mr. Carlson expects to begin driving on this level as soon as the station is completed.——Mr. Weinke is superintendent of the Irwin Consolidated mine at El Dorado cañon. He reports an important strike in the tunnel on that property of four feet of ore that assays $50 per ton. ——A lease has been given on the Jumper mine owned John Anderson. This property has produced some high-grade silver ore.——E. P. Jeans, of the Black Hawk mine, passed through Searchlight on his way to Los Angeles, where he will arrange for the immediate shipment of machinery. He reports that the mine is in fine condition, the shaft is down 315 ft., and in sulphide ore which runs $40 per ton.——E. J. Roberts, the superintendent of the Eldorado-Nevada Mining & Milling Co. has resigned in favor of H. E. Spanogle, who is one of the stockholders of the company.

Searchlight, Feb. 7.

(Special Correspondence).—Crescent is fortunate in the matter of transportation. The Salt Lake system has a station at Nipton, Cal., five miles distant, while the Santa Fe system, which is rapidly building into Searchlight, will have a station on the east of the Crescent hills, from which terminal a road is being built to Crescent, a distance of 11 miles. The cost of transportation of ores to the Salt Lake smelters is $5 per ton, while on the Santa Fe the rate from



Part of Nevada.

Ivanpah to the Needles smelter is $1 per ton.——Water for milling and domestic purposes has been developed and the building of an electric light and power plant is under discussion by Los Angeles capitalists.——The Golden Crescent Co. is running an adit on the vein that crops on the north side of the Crescent hills. The adit is now in 225 ft. Over 500 ft. of work has been done on the vein and good milling ore is opened. A. J. Waddleton is the superintendent. This mine has been working for the past two years.——The Red Star group, consisting of three claims, situated two miles south of Crescent, has been purchased by Samuel McMillen and associates, of Goldfield.

Crescent, Feb. 2.

(Special Correspondence).—Eldorado Canyon is coming to the front faster than any district in Nevada. New wagon roads are being constructed to the Salt Lake System at Jean, 20 miles distant, and the Santa Fe is near Searchlight. The cost of shipping and treating ore was about $75 per ton, but, with reasonable shipping charges, ore averaging around $40 per ton can now be treated at the Salt Lake smelters. At the bottom of the deepest shaft in the district, on the Techaticup, which is down 675 ft., four feet of ore running $600 per ton has been opened. The vein has been followed from the surface. This property is owned by Joseph Wharton of Philadelphia.——Among other properties in the cañon are: The Wall Street, that produced two million dollars from an open stope at the surface: the Quaker City, that has ore exposed; and thirteen other claims, all showing ore.——The new camp is called Nelson, has a post-office, telephone connections with Searchlight, Nipton, Cal., Manvel, and Crescent, and a wire to Front, on the Santa Fe, between Manvel and Searchlight. Water has been developed in many of the properties at a depth of about 225 ft., and the district abounds in springs.——Later companies are: The Honolulu El Dorado, El Dorado Consolidated, El Dorado Nevada, and the Black Hawk companies. The Honolulu El Dorado is in the centre of the district, and a shaft is being sunk to water-level. At this level, cross-cuts are to be run to the Wall Street vein, that is pitching to the north at an angle of 45°. The shaft is 50 ft. deep. The company has leased a spring a few hundred feet distant until they develop sufficient water in the mine. Other properties owned by this company are the Kobe, Manila, Nagasaki, and Hong Kong claims. These claims have been thoroughly prospected on the surface. On the El Dorado Consolidated, samples of specimen ore have been taken from the Kensington claim, where a 5 by 7 ft. shaft is being sunk. The ore is an iron-stained quartz, carrying gold, silver, and galena, and the property is on the strike of the Silver Legion mine of the El Dorado Nevada Co. The El Dorado Consolidated is owned by Jas. T. Wisner.—— The Black Hawk, Silver Sphinx, and Magnolia mines report new finds. Machinery for the Black Hawk, El Dorado Nevada, and Silver Sphinx has been shipped from Salt Lake.

Eldorado Canyon, Feb. 4.

NEW MEXICO.

TRES PIEDRAS COUNTY.

After months of delay, all the machinery for the smelter of the Southwest Smelting & Refining Co., has been received and installed, and the furnaces will blow in at once. Much development work has been done in the mines of the district, in anticipation of the starting of the smelter. The orebodies are not generally high-grade, but they are extensive, and the ores are practically self-fluxing. Tracks have been laid from many of the largest properties, to the smelter, and shipping can commence at short notice.——The Excelsior company, owning several claims in the district, will equip its properties with new machinery, and the Amarillo company, a Boston concern, will push development work.—— The Rio Chama Gold Dredging Co., has purchased 1,200 acres near Vado, Rio Arriba county, and will install a dredge and begin operations in about three months.——Good bodies of copper ore are being found in the Burro Mtn. The most recent strikes are on the property owned by M. W. Porterfield, between Tyrone and Leopold, and on the Robinson group, about half a mile from the Leopold mill.

OREGON.

BAKER COUNTY.

The annual meeting of the stockholders of the Highland Co. was recently held and a new directorate elected. The office of the company was changed from Sumpter to Baker City.——A good vein has been opened on the property of the Sovereign company on Coin creek, 30 miles east of Baker City. John Arthur is the superintendent.——Electricity for power purposes will soon be ready for the Virtue mine. A large force of men is employed under C. P. Loomis, the superintendent.——The placer strike on Boulder creek is still attracting a good deal of attention, and favorable reports are coming from the district.

GRANT COUNTY.

The Glade creek placers, situated 15 miles east of Granite, on the north fork of John Day river, have been bonded by A. J. Dickison to N. Berkeley, who represents an Eastern corporation. There are 160 acres in the property, and have been worked for several years. The gravel bank stands 30 feet high, and the ground has been thoroughly prospected

and promises well.——The tunnel in the Ben Harrison property has now gained a depth of 200 ft. and the vein is reported to be widening in the breast.——The Alamo mine has an adit in on the vein, and good ore has been encountered. A. B. Pierce is the superintendent.

JACKSON COUNTY.

(Special Correspondence).—The Opp mine, at Jacksonville, has been operated intermittently since 1867. It is now owned by the Opp Consolidated Mines Co., of which H. E. Foster is superintendent. The ore-shoots, which pitch to the east, are in a fissure vein that cuts through slate and diorite. The orebodies are developed by five cross-cuts, the vertical distance between the highest and lowest being 700 ft. The ore is taken out through the lowest cross-cut, which is on a level with the crusher-floor of the mill. The ore carries free gold, iron pyrite, and petzite, in a quartz gangue. About 40% of the gold is recovered by amalgamation. The mill is equipped with 20 stamps, tables, and vanners; 20 additional stamps are being installed. With this method serious losses have occurred, in that much of the telluride would float away in the slime. To stop these losses, a roasting-furnace of the Stedtefeldt type has been built, in which the entire product of the mine will be roasted before milling, the object being to volatilize the selenides and tellurides. The experiments made prior to the erection of the roaster convinced the management that this type of furnace, which affords a thorough oxidizing roast, would put the ore in shape—to save the values by amalgamation and concentration. Wood is to be used as fuel in the furnace, which will consume six cords of wood for 20 tons of ore, at a cost of 40c. per ton. The new roaster will be in use in a few weeks.

Jacksonville, Feb. 2.

(Special Correspondence).—C. W. Evans, the manager for the Cyanide Gold Mining Co., of Ashland, reports the property fairly well developed, with gold-bearing quartz in one vein and ore containing cinnabar in the other. A cyanide plant will be erected to treat the gold ore and an equipment will be provided to retort the cinnabar.——The Harms Mining Co., having offices in Ashland and New York, is developing the Briggs property in Josephine county, having 2,000 ft. of work done. The same company is opening a property on Forest creek, near Jacksonville and one on Sardine creek, near Gold Hill. A car of ore shipped from the latter ran $60 per ton. It is announced by E. T. Staples, the superintendent, that a mill will be erected this spring at each of the properties at Gold Hill and Jacksonville.——The Shorty-Hope M. & M. Co., having a property three miles from Ashland, is managed by C. T. Sanford. Considerable development has been done and there is ore in the stopes. It is a gold ore, partially free-milling, but the greater part is carried in the sulphides. Experiments are being made to determine the best method of extraction, and the company may adopt roasting and cyanidation.

Ashland, Feb. 6.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The miners employed at the Maitland property at Garden City have demanded an eight-hour day. A similar demand has been made upon the Minnesota company, operating near there. Manager F. R. Baldwin, of the Maitland, has gone to Chicago to confer with the owner of the property and will give his answer to the men in a few days. The Minnesota has just finished the foundations for a new cyanide plant, and expects to begin milling this summer.

UTAH.

BOX ELDER COUNTY.

(Special Correspondence).—The Southern Pacific Railroad has just completed the location survey for a spur five miles in length from Tecoma to the lower terminal of the aerial tramway being installed by the A. Leschen & Sons Rope Co., of St. Louis, for the Salt Lake Copper Co., of Salt Lake. This tramway will be nearly three miles long and known as the Leschen-Riblett system. It is understood that work will be started on the spur at once. Ore is now being hauled by wagon eight miles to the railroad, and shipped to the U. S. Smelter at Salt Lake. This mine is owned by Lewisohn Bros., of New York, and R. S. McCaffery, of Salt Lake, is the manager.

Tecoma, Feb. 11.

WASHINGTON.

SNOHOMISH COUNTY.

(Special Correspondence).—The Seattle-Boston Copper Co., of Seattle, is operating in the Burns mining district, on the west slope of the Cascade range. The purpose is to build a railroad, from Foss river on the line of the Great Northern, to their camp, and erect a tramway. The company has contracted to take out 75,000 tons of ore. Within the last ninety days 93 ft. of sinking and 75 ft. of driving has been done. The ore runs from 1½ to 28% copper, averaging about 7%.——The Pittsburg-Gold Mountain Mining Co. is developing at Darlington, in Snohomish county, and has an experimental plant for testing its copper ores. A larger plant is contemplated.

Portland, Feb. 1.

STEVENS COUNTY.

(Special Correspondence).—Native copper has been found in the vein of the Lucky Bill mine, four and a half miles east of Northport. The ore was found in the face of the drift-tunnel, now in 200 ft., with a depth of 40 ft. on the lode. The vein matter is a hard white quartz sprinkled with spots and seams of copper and iron. The vein has widened to two and a half feet.—— The Jay Gould is being worked by two shifts of men, and cross-cutting from the 180-ft. level will commence this week. The cross-cut will expose the rich shoot of ore that has been opened at the 100-ft. level, and from which the last car of ore was shipped. Several other properties are coming to the front as producers, and will be in shape to ship steadily in the spring. —— A strike of high-grade ore was made on the Palmer Lake group recently, at a distance of 91 ft. from the tunnel portal. The vein encountered is three feet wide. The claims are owned by a company of Ohio people, and are situated on the west side of Palmer mountain, about one mile north of the Pinnacle group. The work now being done is the annual assessment work, but it is likely that on the strength of the new strike the company will proceed with permanent development. The ore encountered is a mineralized quartz, carrying both gold and copper.—— The Gold Mountain Co., which owns an antimony property in the Money Creek district, is installing machinery to treat its ores.—— The smelting plant at the property of the Galagher Mining Co., in the Clealum district, is completed, and will be blown in soon.—— The Great Excelsior Co., which owns a gold property, has ordered a cyanide plant. The mine can furnish a tonnage of ore averaging about $3 per ton. The ore is quarried out of the mountain side.——There is reported a strike of antimony ore by H. Harrett on his group of claims, 28 miles south of Kettle Falls, in Stevens county, north of Spokane. While development work is being pushed no ore will be shipped until connection is made by the Columbia River Railway & Navigation Co., with the Spokane Falls & Northern railroad to bring the product to Spokane for shipment to the reduction plants.—— The Mineral Hill Mining Co. is to resume active work on its property near Conconully. The tunnel is now in 2,000 ft., and, according to surveys, will cut the lode in 200 ft.—— T. F. Hertzell, a mining operator from the Chewelah district, reports that several properties near Chewelah are now shipping to the Northport smelter, and among them are the United Copper Mining Co.'s mine and the Copper King.——Edward A. Dolan reports a strike of gold-copper ore on the Pioneer group, 25 miles north of Conconully, Wash. The group was located 14 years ago. There is molybdenite in the vein, and the values in copper and gold are excellent—the ore running about $20 in gold per ton. The lode is 10 ft. wide, with porphyry on the hanging and slate on the foot-wall.—— The Spokane Mica Co. has received a carload of mica from its mine near Troy. It is the only shipping mica mine in the northwest. C. L. Maydwell, of Spokane, is president.

Spokane, Feb. 10.

Special Correspondence.

London.

Profit-Taking Depresses Market.—Shortage of Fuel in Siberia.—Difficulties of the Zinc Corporation.—Deep Leads Making Progress.—Cornish Mining.—Dolores Pays a Dividend.

In the mining department, as in nearly every other section of the Stock Exchange, the fortnightly account, the adjustment of which is now proceeding, is reported to be distinctly disappointing. Early in the account the bank rate was reduced to 5%; but, so far from the change having resulted in a further increase in business it was practically coincident with a sudden restriction of buying orders, with profit-taking upon a somewhat large scale and with renewed sales for the fall. The fact is all the more disappointing to Kaffir stockholders as the labor outlook in the Transvaal is certainly more hopeful than it was a few months ago, and there is a growing impression that the industry will be enabled to come to satisfactory terms with the legislative body, which is shortly to take over the reins of Government. The latest results reported by the principal Rand companies are also of a favorable character, the recent developments in the South Rand property being considered of an especially encouraging nature, not only for the company immediately concerned and for its parent (the Rand Mines) but for the neighboring deep-level mines. Other descriptions have weakened in the course of the account. A fall of 5¼ in Siberian Proprietary (from 14 to 8¾) is noted, in spite of the announcement that Prince Khilkoff, late Imperial Minister of Railways, has been elected a member of the board. Orsks have receded 1 3/16, to 1 7/16, Sesan Syndicates have lost ¾, Siberian Syndicates ½, Troitzks 5/16, and Kaneika United Goldfields 9/32. Broken Hill Proprietary has given way 1 3/32, British Broken Hill and North Broken Hill ¼, and Zinc Corporations show a drop of a shade over 3/16 at 41s. 9d., after being nearly 50s. Even the leading copper shares have shown a declining tendency, and Spassky has failed to maintain the rise in price which followed the news early in the month that the ore reserves were doubled in value, inclusive of a million sterling or more "reasonably assured." Later advices state that copper shipments were about to commence and that the smelter-fuel trouble was over. From the manager's letters recently issued to the shareholders it appears that the transportation of coal and ore has "been the burning question of the hour," and that "the collapse of the coal supply at Spassky * * * * has produced disastrous consequences," consequently "the railway must be built at all costs and quickly." This is all the more deplored seeing that both the Company's mines are in a condition to promise a large and valuable supply of mineral, and that as regards surface improvements the end may be almost considered in sight. The shortage of coal has arisen from two causes; in the first place, the flooding of the workings at the time the thaw of last spring set in, and then when the mine was unwatered in May the miners left for their homes in spite of every means employed to induce them to stay. When the miners did return in October and November the teamsters went out, so that the coal sent to grass could not be hauled to the smelter. At the moment of writing (on Christmas day) the manager was hoping for the coming of snow in sufficient quantity for regular hauling to be resumed. "It all depends upon the weather," is a sufficient indication of the importance of the railway, for which most of the material is stated to be delivered or on the road. The manager believes it is estimated that coal may be delivered to within seven *versts* of the smelter early in the coming (Siberian) spring, by which time it is hoped the bessemer furnace will be running.

To counteract rumors, which were set in motion for the purpose of 'bearing' stock in the Broken Hill section of the market, the Zinc Corporation has issued a circular to its shareholders in which the general managers in Australia flatly contradict the statement that the plant is a failure. They state that in the rush of construction an air-lift for circulation of acid liquors was put in which proved of insufficient depth, and an air-compressor proved of insufficient capacity. "Cast-iron centrifugal pumps were installed (these appliances being temporary) till proper lift and air-compressor erected. Pumps lasted only four days. During this time, while portion of the plant was running, high-grade flotation concentrates 45% zinc and 7% lead were obtained with residues of 4.4% zinc, and 1.1% lead confirming the previous work. Additional improvements are being made by erecting settling vats for re-crushed tailing, as an additiona safeguard for continuity of operation in flotation plant. Minor details require adjustment. Nothing beyond the usual experience installing large mill on a new process." The managers are confident that difficulties will be rectified in the course of a few weeks. The shares are, however, still weak on the market on fresh rumors that the plant has again broken down.

An uneasy feeling prevails as to the future of the 'deep lead' companies, and this has not been allayed by the progress report issued by Loddon Valley Goldfields. In the opinion of the market some two or more, probably three, months will be required to arrive at definite results as to the value of the deep lead in this particular property. From the report in question it appears that the tunnel at 454 ft. in depth, driven under former management, proved to be too high to get under the 'deep' ground, only the 'bench' being accessible, and it was necessary to sink the Keystone shaft and drive a new tunnel at 500 ft. in depth. This latter tunnel reached a point corresponding to that opened by the 454-ft. level, about the end of December, and is now being extended at the rate of about 40 ft. per week. By the end of January it will be one-half the way under the 'deep' ground, and has to be driven about 600 ft. farther to get entirely across under the ancient stream. In the meantime, lateral drifts are being put out, both north and south, from this tunnel, with a view to draining the wash, to effect as early an entrance into the 'deep' ground as is possible. The managers state that they are unable to indicate a definite date when work will have reached a point where it will be possible to enter the 'deep' ground, but that, at the outside, it is a matter of a few weeks.

In Cornwall the local press continues an eager discussion of the 'dues' question. It is understood that the 'lord' (Mr. Fortescue) will not sell his rights in Grenville United and Great Condurrow. With reference to the widespread rumor that Carn Brea mine has been working only under promise of a lease, J. Trevethan, the secretary, states that a lease was granted ten years ago giving the Carn Brea Co. right to work the sett under the reservations therein stated for a term of 60 years from April 13, 1896, giving, therefore, over 49 years yet to run. The lease in regard to Viscount Clifden and Tincroft sett is also completed and provides for the same terms and time as the lease granted by Mr. Basset. So far as Dolcoath and the new lords are concerned, *The Cornish Post* remarks that the hands of the clock are moving slowly. The directors, realizing that the share market was weakening, promptly countered by issuing a statement that their rights are protected by a lease which has 48½ years to run, and that at the meeting on February 28 they propose paying a two-shilling dividend,

which will absorb over £30,000 of the £100,000 cash they have in hand. They, naturally, made no allusion to the negotiations between themselves and the new lords with a view to purchasing the royalties in Dolcoath sett; but the public is still busily engaged in speculating as to what is transpiring, and what will be the result of the latest developments. Rumor has it that the first sum mentioned by Messrs. Meyerstein to Dolcoath was £200,000. If so, this must have been to 'open the ball,' as no business could be expected at this figure. From many points of view it may seem advantageous to Dolcoath to compound her future tribute to the lords for any sum up to £150,000; but there seem to be quite a number who prefer paying a possible £14,000 per year for 48½ years to parting with even £100,000 cash at one fell swoop. In the old days they clamored for big dividends, and a £5 dividend was pounced upon with exceeding great joy, although the money ought to have been spent on stone-

Eastern Australia.

breakers, Frue vanners, a new shaft, or in other ways, to strengthen the mine and enable it to cope with possible low prices, which, as a matter of unpleasant fact, began to rule almost from that time. So far as many of the shareholders are concerned, the old adage that "a bird in hand is worth two in the bush" is still regarded as worthy of all belief. A report from South Crofty for four weeks ended January 19 states that the 32 heads of stamps crushed 775 tons for 14 tons of tin and wolfram; average recovery, 40.4 lb. The excavations for the new Californian mill, 20 heads, are near completion. Tin and wolfram on hand are estimated at 37 tons.

Many new schemes are in the air for resuscitating old mines, and starting new ones, some of which it is to be feared may be found to retain their 'virgin' character as unlikely producers of the favorite metal. It is reported that operations at New Grenville, near Camborne, are being actively undertaken by the syndicate which has secured this property. Recently a new engine was installed, and is now working at the shaft being sunk on the eastern part of the ground with a view of testing this portion, where the indications are of a favorable character. The tinstone raised is highly mineralized, although the depth of shaft sunk is at this point only a few fathoms. On the north boundary, close to Wheal Grenville, an old shaft is being cleared and secured, and it is considered probable that this shaft was put down to a considerable depth. If this should prove correct, it will be a very valuable feature, as with little delay machinery could be erected, and active operations proceeded with in obtaining produce therefrom. Capt. James Rowe, of Camborne, is superintending the operations on behalf of the syndicate, which, it is understood, is about to negotiate for the disposal of the property. Some five lodes of tin and copper have already been traced within the limits of the sett, and two adit levels were driven west from the eastern boundary for a considerable distance. Some tinstuff from the 'filling' of the old north shaft assayed a high percentage of tin—from 14 to 16 lb. per ton. It is thought that this property is likely to come to the front before long, as its position, near the great deposits of metals surrounding the Carn Brea hill is among the best in Cornwall.

Another Mexican mine on the London market has entered the dividend list, Dolores Ltd. having declared a distribution to its stockholders of three per cent, payable on February 25.

Salt Lake, Utah.

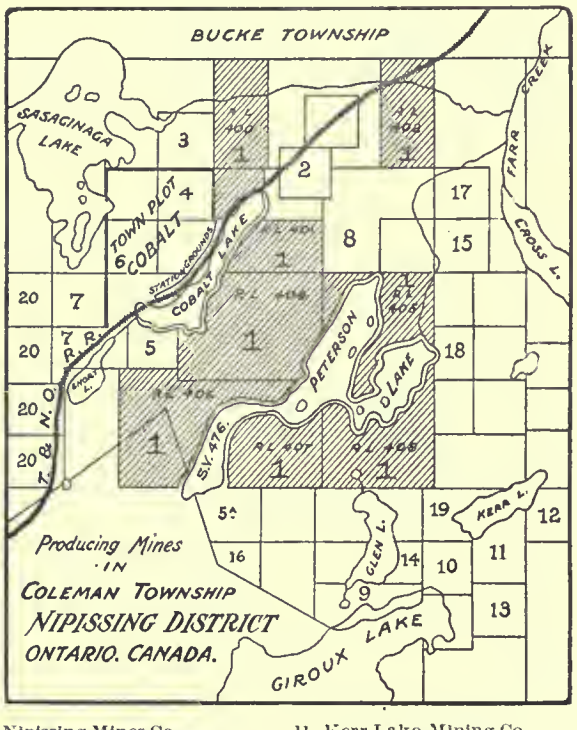
New Concentrator at Bingham.— Smelter Smoke Trouble.— A Settlement Likely.— Columbus Consolidated.— Electric Power for the Cactus.—Shipments from Tintic.—Dividends.

Contracts will be let shortly for the structural material and equipment of the concentrating mill to be erected by the Ohio Copper Co. at Bingham. A site has been selected at a point near the Dalton & Lark mine. The plant will be equipped to treat 2,000 tons of ore daily, and the water supply will be obtained from the Mascotte tunnel, one of the adits of the Dalton & Lark mine, which is also to become the avenue through which Ohio ores will be brought for treatment in the future. By pushing the adit ahead 7,000 ft. more, it will not only serve as an outlet for the Ohio ore, but it will tap the low-grade copper deposits of the Commercial mine, another of the Heinze properties at Bingham. After becoming a factor in Bingham Consolidated management, Mr. Heinze acquired the Ohio, and his engineers are now directing the work of active development.

There is every indication now that the American Smelting & Refining Co. will continue to operate its lead smelter at Murray indefinitely. The manager of the plant and the smelting company's attorneys have been busy for weeks with the hope of bringing about an adjustment of the differences with the farmers. It will be remembered that the late smelter-smoke case, tried in the Federal Court before Judge John Marshall, resulted in a decree enjoining the several smelting companies in the Salt Lake valley from continuing the practice of smelting ores containing an excess of 6% sulphur on the charge, or throwing out fumes that might do damage to vegetation. For a consideration, it seems, the farmers have been persuaded to believe that conditions are not so bad as they have really been painted; for they are now willing to permit the lead smelters to operate at their old sites. Consequently, Judge Marshall will be asked to make a modification of his decree. If things come out all right and the decree is changed to suit conditions, the farmers will get $60,000; the first payment of $20,000 to be made as soon as the stipulation is properly made out and filed and $40,000 when all the plaintiffs sign a smoke easement, relieving the smelting company from being subject to further damage suits; provided, of course, that

the corporation lives up to its part of the agreement; which is to build a system of bag houses and cooling chambers into which the fumes shall be introduced for purification. A plant of this kind is now in process of installation at the big Murray plant and the smelter management sets up the claim that the system has been brought down to a point so near perfection that all deleterious substances will be removed or so modified as to be absolutely harmless.

During 1906, from the Columbus Consolidated mine at Alta was produced 6,590 tons of first-class ore, of which 6,134 tons were sold at an average of $43.33 per ton. There were mined 12,299 tons of milling ore of a gross valuation of $11.15 per ton. The receipts, including $28,646 on hand at the beginning of the year, were $432,175, while the disbursements amounted to $280,286. A total of 4,124 ft. of new development work was done; the cost of milling is given at $1.21; but no statement is given as to the expense of mining. Tony Jacobson was re-elected president and general manager at the recent



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Tretheway Silver-Cobalt Co.
4. Coniagas Mining Co.
5 & 5 A. McKinley-Darragh.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay

annual meeting of shareholders. It is likely that the company will join with other operators and build a standard-gauge railroad to a point within five miles of the town of Alta during the present year. The company paid its initial dividend of $45,000 in January and it has been announced that it will be paid quarterly hereafter.

The Newhouse Mines & Smelters Corporation has arranged for the purchase of electric power to be used in in its Cactus mine and mill. Although the company's properties are splendidly equipped with facilities for making power, the management is looking to the future. A repetition of the late coal famine is to be avoided. The first delivery of power is to be made at the close of next autumn.——C. A. Short, the manager for the Jenny Gold Mining Co., at Gold Springs, Iron county, has announced that the mill now under construction at that property will be ready not later than May 1.

The Eureka Railway Co. was formed a few days ago. It is a subsidiary company to the Tintic Smelting Co., which is about to construct a lead smelter in the Tintic district. The railroad will be built to several of the principal mines of the district. C. W. Nibly of Salt Lake is president of both concerns.——The ore shipments from the Tintic district last week amounted to 148 carloads, as follows: Ajax, 3; Beck Tunnel, 12; Bullion Beck, 9; Carisa, 4; Centennial Eureka, 49; Eagle & Blue Bell, 7; Eureka Hill, 2; Gemini, 5; Godiva, 1; Grand Central, 10; Mammoth, 11; May Day, 5; Ridge & Valley, 3; Scranton, 6; Swansea, 3; Tintic Iron, 8; Uncle Sam Con., 3; Victoria, 4; Yankee Con., 3 carloads.

Toronto, Canada.

Shipments From Cobalt.— A New District.— The Bureau of Mines Enriched.—The Laurentian Consolidation.—News From Cobalt.— Development of the Nipissing.— Diamond-Drilling Through the Ice.—Amalgamated Cobalt.—The Cobalt Chief.

Shipments of Cobalt ore for the week ending Jan. 26 amounted to 257 tons. The following were the shipping mines: Silver Queen, 62 tons; Nipissing, 62; University, 30; O'Brien, 30; Coniagas, 28; Cobalt Townsite, 23; Buffalo, 20 tons.

A new mining district is being opened up in the Sutton Bay country, north of Lake Temiskaming, situated in Harris township, a few miles northeast of New Liskeard. It is commonly known as the Casey Mountain range. The formation presents a similarity to that of Cobalt camp, showing the same Lower Huronian series with diabase contact. The mountain range extends for a mile and a half and has all been taken up. Native silver has been found. Two companies are already operating. The Silver Crescent Mining Co. has 15 men at work in charge of Herbert Murray, a mining engineer with a Californian experience. Several promising veins carry cobalt ore and native silver. The Bucknell Mining Co., working on an adjoining claim, employs 25 men. A shaft has been sunk 40 ft., and driving has been done for 60 ft., following a vein that contains smaltite and native silver. The company is erecting an engine and boiler house preparatory to installing a modern plant.

The revenue of the Ontario Bureau of Mines for 1906 aggregated about $250,000. This includes payments for bonuses and royalties in connection with mining grants. The receipts for the previous year were only $61,560.——The Laurentian gold mine in the Manitou Lake district, together with other mineral properties in that area, have been secured by the Hugo von Hagen Exploration Co., with $15,000,000 capital. Anthony Blum becomes general manager. This consolidation of interests is likely to result in extensive development work on the Manitou Lake properties.

As a result of the recent visit of officials and directors to the Nipissing mines, at Cobalt, a comprehensive plan for the development of the property has been mapped out, including exploration as to depth as rapidly as possible. The four shafts on veins 49, 26, 19, and 10 will be put down to 300 ft. at least. More than 800 acres of the company's holdings are as yet untouched, and as soon as spring opens this area will be prospected. The force of miners is to be largely increased.——The Cobalt Central Mines Co. has made the first ore shipment from the Big Pete mine. A drift has been started into Diabase Mtn. on the Big Pete vein at the bottom of the shaft. The ore is 26 in. wide at this point, comprising a 4-in. vein of smaltite, assaying 12,000 oz. per ton, and 22 in. of native silver running through the diabase filling of the vein. ——E. B. Rochester, managing director of the Cobalt Lake Mining Co., reports that a vein of native silver 8 to 12 in. wide has been unearthed on the east side of the right-of-way included in the company's property, assaying 975 oz. per ton. Since the beginning of operations

seven veins have been disclosed, comprising niccolite, smaltite, and cobalt bloom. A steam-drill has been in operation in two places and a shaft is being put down. Preparations are going on for diamond-drilling the southern portion of the lake bed through the ice, T. Travers being in charge of operations.——At the property of the Amalgamated Cobalt mines, near the Trethewey and Coniagas, development work is being pushed. A shaft has been sunk for 100 ft. between two veins, and on reaching the 150-ft. level a cross-cut will be run both ways. A 60-h.p. boiler, 4-drill compressor, and steam-hoist, supplied by the Rand-Jenckes Co., have been installed and 16 men are at work under A. L. Fowler, formerly a California miner. The Amalgamated is also operating on a 40-acre location north of the Silver Leaf, where a 50-ft. shaft is being put down on a promising calcite vein.——The Cobalt Chief mine, formerly known as Moore & Hare's claim, in the Portage Bay extension, has undergone considerable development during the last few weeks. A shaft and power-house have been put up and a Rand-Jenckes steam-plant installed. Two shafts are being put down, that on the main vein, now down 30 ft., being at the point of contact with a cross-vein. Some 30 men are employed, in charge of J. T. Fee, who was formerly engaged in copper mining in Michigan.

Cripple Creek, Colorado.

Active Leasing Operations.—Economic Mill Burnt.—Golden Cycle Mill Starts.—The Portland Report.—Improved Methods.

The plant of the Economic Gold Extraction Co., situated on the west slope of Squaw mountain above Eclipse gulch, was destroyed by fire on January 30. The loss is estimated at a quarter of a million dollars. Fire was first discovered in the early morning near the ore-bins and, helped by a slight breeze, soon extended to the other buildings. The mill was erected by the Wood's Investment Co. in 1899, and the chlorination process was in use, which proving unsatisfactory owing to recent advances in other methods of ore treatment, necessitated the closing down of the mill last June.——Operations have been commenced within the last few days by the Golden Cycle Co. on its mill at Colorado City. Three of the 100-ton roasters have been fired. It is estimated that there are 8,000 tons of ore bedded awaiting treatment, and that enough ore has been contracted for to keep the plant running at its maximum capacity for two years.

No better general view of the situation in this district can be gained than that afforded by a careful study of the annual report of the Portland Gold Mining Co., just issued. The conditions encountered by this company, typical in some degree of the whole district, the means by which they are met and the tabulated statements of cost here gathered together, are of the highest interest, not only to those operating in the district but to engineers in general. The folly of robbing the stopes of the higher-grade ores, trusting to lowered costs in the future to then make the removal of the lower grade profitable, has become apparent. To keep large expanses of stopes open for indefinite periods pending their final cleaning up adds materially to the final cost of extraction. To clean out stopes as they progress means handling a larger tonnage of lower grade rock. To do this and maintain profits make necessary lower costs for treatment. Hence the pressure on all departments for cheaper and better methods, and the strong probability of rather sweeping changes in the near future.

Extraction charges offer little chance for reduction. Probably three-quarters of the rock broken is hoisted to the surface at a cost of about $2.50 per ton. Nearly two-thirds of this is sorted out and thrown away, at a cost for sorting alone of nearly $1.50 on the final tonnage. The increased cost for mining on the reduced tonnage is correspondingly higher, $8.75 per ton. The charges for transportation to the mill are nearly $4, considerably more than the cost of treatment there. It is clear, then, that development must proceed along two lines; the devising of processes cheap enough to treat ores without sorting, and the moving of mills to the mines, if freight rates remain high. It seems curious to compare the relative costs of transporting a ton of ore from Duluth to Pittsburg, and from Cripple Creek to Colorado City. Of course other conditions not mentioned here help to complicate the problem, but the essential features are as sketched.

In the pressure for a cheap process, the fate of chlorination seems sealed. The cost is too high and the tailing too rich. Not long ago the sentiment of the district was strongly in favor of chlorination, now it is becoming equally strong in favor of cyanidation. Several smaller mills are going up or are already in operation at the mines; the Portland is considering the erection of a large plant at the mine. The present year is likely to witness more radical changes than any preceding one. A minor but interesting change is the substitution of a round rope for a flat one in installing the new hoist at the No. 1 shaft of the Portland. Flat ropes have prevailed in the past in spite of what seems to engineers in other districts their obvious disadvantages. But if it requires a fire to procure their removal, changes in this regard will certainly be slow.

Butte, Montana.

Shortage of Fuel Affects Output.—The Goldsmith Makes a Strike.—North Butte Extension and Its Prospects.—The Reins Copper Co.—Mining near Red Rock.—Gossip Concerning the Snowstorm.—Flynn Consolidated.—La France.

During the past six weeks all of the Butte mines have been closed from one-third to one-half of the time on account of a shortage of fuel and cars for the transportation of ore. After the thaw last week all the big mines resumed operations at nearly their full capacity, although the lack of transportation threatens a continued interruption of operations at the mines of the Boston & Montana Co. The Coalition, North Butte, and Boston & Montana companies have been the heaviest sufferers.

An excellent body of copper ore has been struck in the Goldsmith mine, the principal property of the Goldsmith Mining Co. The mine has for a number of years been a producer of silver, but during the past six months has been running into copper with increasing depth. The Goldsmith is situated some distance west and north of the Alice group of mines.——The Davis-Daly Estates Co. cut the Smokehouse lode on the 500-ft. level and is driving east and west in ore, which is increasing in value as the work progresses. It is the same vein that was cut on the 200 several years ago. In the opinion of C. H. Palmer, superintendent of the mine, the company will be hoisting and shipping ore from the Smokehouse within six months. The work of sinking on the Colorado is also progressing rapidly, and by the time the drift from the Smokehouse reaches a point immediately north of the Colorado it is expected that the shaft of the latter will have reached a depth of 1,000 ft. and cross-cutting to the same vein will have been completed.

The North Butte Extension Copper Mining Co., recently organized, is making preparations to begin development work on its properties adjoining the Berlin group of the North Butte Co. and the Blackrock mines of the Butte & Superior Co. Machinery for a complete surface

plant has been ordered and a railroad spur from the Northern Pacific is being built to the place where the shaft will be sunk. The claims of the North Butte Extension Co. are entirely undeveloped, but they are in a good territory. Immediately south of its property the North Butte is sinking on the Berlin. On the west Senator Clark is sinking on the Poser and the Butte & Superior is deepening the shaft of the Blackrock. The Blackrock and several other properties of the Butte & Superior have been producers for many years, their product being gold and silver, but the Blackrock is now being developed into a copper mine. Directly east of the Black Crow claim, on which the North Butte Extension Co. will sink its shaft, the Butte & London is sinking a shaft that is now 800 ft. deep and has cut several stringers of ore, one a vein of good size and value. Further east, on the Six O'Clock, the Butte Copper Exploration Co. has a shaft 1,000 ft. deep and is cross-cutting north and south at that depth, having cut one fine copper vein. Southwest of the Extension claims, the Boston & Montana Co. is sinking on the Badger to develop the extension of the rich Jessie vein of the North Butte Co. All the operating companies in that part of the district expect to develop rich mines, but at present the North Butte and Butte & Superior have the only developed mines of any consequence. The Blackrock vein is believed to strike through three of the Extension Co.'s claims. W. T. Van Brunt of New York has been elected president of the new company.

The Reins Copper Co. has acquired the Ella and Louise mining claims, which adjoin the Combination owned by the company, and has increased its capital stock from $1,500,000 to $3,000,000 to pay for them. The developments of the orebodies in the Combination made it desirable to own the Ella and Louise in order to protect the company's veins. J. M. Guffy of Pittsburg, the chief stockholder and financial backer of the Reins Co., took the title of the Ella and Louise in his own name and then offered to turn the properties over to the company for the increased capital stock. The offer was accepted. The par value of the stock is $1.50 and it is selling on the Butte exchange at $1.10. The increase of the capital stock was authorized at a recent special meeting of the stockholders at which 804,345 shares out of a total of 1,000,000 shares were represented and voted in favor of the increase and the purchase of the property. The company also reports that it is indebted to Colonel Guffy and associates $202,000. The company, after four years of persistent but long discouraging work, is developing a good mine and has begun taking out ore.

The Superior & Montana Mining Co. has been organized for the purpose of doing some exploration work in the Red Rock district, 21 miles west of the Oregon Short Line railroad in the southern part of Montana. The company is capitalized for 600,000 shares of stock at $5 par. Calumet, Mich., men are largely interested in the new company, and they are the same men who organized the Calumet & Montana Co. On one of the claims owned by the new company there is a shaft 100 ft. deep and the showing is said to be good, a vein 2½ ft. wide assaying from 7 to 19% copper, with some gold and silver. The company owns seven full claims and expects to begin development work on them about the middle of February, if the weather permits. An air compressor and other machinery is expected to be delivered by that time.

The report is again out that F. A. Heinze of Butte is negotiating for the purchase of the Snowstorm mine at Mullan, Idaho, but when Mr. Heinze examined the property several months ago he said he did not want it. The only thing that has ever thrown discredit on the Snowstorm has been the eagerness of the present owners to sell the property, which has been peddled among all the big companies and copper men in the country. Among those who have recently had the mine examined for them are the Lewisohns.——It is reported that the directors of the Ida-Montana Development Co. are considering the advisability of re-organizing. The company is developing some claims in the southeastern portion of the Butte district and the showing is considered good enough to warrant the organization of a mining company. The exchange basis is to be about three shares of the new company for one of the old.——There is a possibility of the organization of a new company to take in the Granite Mountain mining claim owned by the Lewisohns, and the Tuolumne claim owned by the Tuolumne Mining Co. The Lewisohns are engaged in sinking a deep shaft on the Granite Mountain, and some extensive and rapid development work is being done on the Tuolumne. Both claims are well situated, the Tuolumne adjoining the Speculator mine and the Granite Mountain being next to the Jessie mine of the North Butte Co.

The Flynn Consolidated Mining Co., which owns a lot of mining claims near Hailey, Idaho, is about to begin development work on its properties. The company has been financed by Butte and New York men and at a recent meeting of the directors George W. Munroe, of New York, was elected president, and C. W. Andrews, secretary.——La France Copper Co. is placing the Lexington mines in condition for a large increase in the ore output, and in six months the daily output is expected to reach 300 tons. The mine for many years was filled with water and it required a year's work to pump the mine dry. The lower workings are now being cleaned up and repaired. The mine is about 1,500 ft. deep. La France Co. has been mining on the upper levels for more than a year and is making regular shipments of good ore.

Denver, Colorado.

Development in Depth at Cripple Creek.—Reduction of Treatment Charges.—Competition Between Cyanidation and Chlorination.—New Mills.—Good Prospects for Current Year.—Transfers of Property.—Drainage Adit.—Promising Outlook.

Cripple Creek is now at a most interesting stage in the history of its development. In fifteen years it has produced 221 million dollars in gold. It was not strange, therefore, that a few years ago certain timorous ones began to suggest that possibly the ore deposits were in danger of becoming impoverished in depth, and that perhaps the beginning of the end of this great district could be dimly discerned. These fears were laid to rest by the publication of the admirable report of the geological investigation conducted under the joint auspices of the State of Colorado and the United States Geological Survey by Messrs. Lindgren and Ransome. It was there pointed out that surface enrichment could not be observed in the veins; and, therefore, so far as logical inference goes, the veins may well hold their values indefinitely, if they themselves persist in depth.

But other factors also affect the production of a mining camp. With the 16% reduction in the output for 1906, compared with that of 1905, has come a corresponding pressure for the reduction of treatment charges. Cyanidation has locked horns with chlorination in what promises to be a death struggle and all who are interested are anxiously awaiting the outcome. The United States Smelting & Reduction Co., which has been chlorinating by the electrolytic process, concentrating and cyaniding its tailing, is said to be seriously considering abandoning the barrel room The Portland Gold Mining Co. is just completing a 400-ton plant for fine grinding in cyanide solution in tube-mills to treat the tailing that has been accumulating from its chlorination plant. This plant is supposed to

contain $2.50 per ton, hence a handsome profit is expected. One tube-mill is lined with silex blocks and it is planned to line the other with cast-iron liners, which will furnish a useful comparison. The Golden Cycle mill is now in operation and is offering to treat ores for $3 per ton less than the rate heretofore asked. This reduction has been met by the smelting companies, which means a correspondingly great saving to the mines which do not possess reduction works. The process at the Golden Cycle is, after roasting, to catch the coarse gold by amalgamation and then to cyanide. The outcome is awaited with interest, for much skepticism is rife as to whether the loss of mercury can be kept so low as not to effect the cyanidation unfavorably. The Gillett cyanide mill has been purchased by the new management of the Jo Dandy and is being removed to that property. It is also said that Stratton's Independence, Ltd., is planning the erection of a cyanide mill. Altogether, it seems as though cyanidation were destined soon to triumph. Bromocyanidation will now have a fair chance, and it would not be strange if it were to make a better showing than it has in previous trials.

With the lowered costs has come a correspondlng activity in mining transactions, and the prospects seem bright for a marked increase in production during the present year. The Trilby and Ben Harrison claims on Bull Hill have been purchased by Markle, Montgomery & Conning from the Moose Mining Co. The Delmonico, and a portion of the Maud Helena on Bull Hill, have also been purchased from the Union Gold Mining Co. by I. W. Duner, and associates. The claims last mentioned form a portion of the Stratton estate, and the transfer is interpreted to mean that the executors are disposed to segregate its vast acreage into small holdings. The control of the United Gold Mines Co. has passed into the hands of J. T. Milliken, president of the Golden Cycle. This involves over 400 acres of some of the best property in the district. With the change in management has come a reduction in royalties, and more than fifty lessees are now at work.

With the announcement of the intention of the mine owners to begin driving the deep drainage adit another note of encouragement is sounded. This adit is to have its portal in Gatch Park at an elevation of 8,020 ft., or 753 ft. lower than El Paso, the lowest of existing adits, and will go far to solving the water problem. It is expected to drive it to the main water course—a distance of 15,550 ft.—in two years. It is then planned to continue it to the Vindicator shaft, giving a total length of 27,190 ft. This distance is to be driven in five and a half years, at a cost of $721,000. The mine owners are, wisely enough, raising a fund of $1,000,000 for this purpose. D. W. Brunton is the consulting engineer, and, if his recommendations are carried out, the adit will be 7 ft. wide by 10 ft. high, and have a grade of one foot in 300. The heading is to be driven in both directions from a shaft 10,000 ft. from the portal and diamond-drills are to be used to hasten the work. Ventilation will be obtained by the use of positive blowers. In the light of these improvements, present and prospective, the future of the district seems most promising.

Calumet, Michigan.

Storms Block Ore Shipments.—Exploratory Operations.—Strike Ended at the Mass.—Atlantic Cuts Lode on Section 16.

The January production of the Lake Superior copper district was curtailed considerably because of severe storms that blocked the railroads and prevented regular shipments of ore from the mines to the stamp-mills. In Ontonagon county the Michigan and Mass Consolidated mines suffered especially. Snow blocked the branch of the Mineral Range road leading to the Michigan and prevented any shipments being forwarded to the Atlantic mill, where two heads are under lease, for several days. In Keweenaw county the Mohawk and Allouez also suffered from the storms. The Wolverine and Centennial mines, in Houghton county, lost a few days' production, owing to the same cause. Other mines suffered to a less extent. Diamond-drill work from surface has been resumed at the Rhode Island property and the Kearsarge amygdaloid formation will be more thoroughly explored. The Rhode Island has had two drills in operation underground for some time. At the Tecumseh property, which is now part of La Salle and controlled by the Calumet & Hecla company, development work is being pushed steadily. Shipments are being made to the Franklin mill. The showing underground continues excellent and drift-stopes are being extended on the three bottom levels. There has been no change in the local management of the Tecumseh as yet, R. M. Edwards of Houghton continuing as superintendent. Notices have been issued of the annual meeting of the Keweenaw Copper Co., which will be held at New York on February 12. Charles A. Wright of Hancock is president and Captain Thos. Hoatson of Laurium is general manager. The Kewee-

The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

1. Ætna	19. Tamarack
2. Empire	20. Osceola
3. Delaware	21. Tecumseh
4. Amygdaloid	22. Rhode Island
5. Copper Falls	23. Franklin, Jr
6. Central	24. Franklin
7. Phœnix	25. Arcadian
8. Cliff	26. Quincy
9. Mohawk	27. Isle Royale
10. Ahmeek	28. Atlantic
11. Allouez	29. Baltic
12. N. Kearsarge	30. Trimountain
13. Wolverine	31. Champion
14. Mayflower	32. Belt
15. Centennial	33. Adventure
16. Tamarack Jr	34. Mass
17. S. Kearsarge	35. Michigan
18. Calumet & Hecla	36. Victoria
	37. Winona

naw Central railroad is now operating passenger and freight trains between Calumet and its northern terminus, Mandan, the trains being run over the tracks of the Mineral Range south of the Mohawk mine.

At the Atlantic company's exploratory shaft on Section 16, a vein carrying some copper has been encountered. It is too early to state positively whether the formation is the Baltic or some other lode, but it has some of the characteristics of the Baltic.——After an idleness of twenty days, caused by some of the employees striking for higher wages, work has been resumed at the Mass Consolidated mine in Ontonagon county. A special meeting of the directors was held at Boston, the superintendent, James M. Wilcox, and the president, Charles A. Lamb, going east to attend. It was decided to offer the miners an increase of ten cents per day, or $2.35, the same as is paid at the Michigan mine, and the trammers $2.07, the same as before the strike. The men decided to accept these terms. The strike at the Mass mine was free from disorder and the best of feeling prevails between the workingmen and the mine management.——C. R. Forbes, engineer at the Michigan mine, Ontonagon county, resigned a short time ago to accept a more responsible position in the Tonopah district, Nevada.——Development work at the Franklin Junior portion of the Franklin mine is going forward steadily. There is a steady improvement in the openings and the bottom levels are looking well. No. 2 shaft and rock-house will be completed shortly and as soon as the equipment is fully installed, the production at that point will be increased.

Victoria, British Columbia.

Mining in the North. — Prospects on Knight's Island. — Prince William Sound. — The Tyee. — Explorations on Vancouver Island.

This is the season of the year when the prospectors and owners of mining properties in Alaska and the British Yukon gather at Seattle, Vancouver, and Victoria to take a holiday and at the same time bring their properties to the notice of the representatives of capitalists, many of whom reside in the Coast cities and are prepared to take bonds on properties in the North. Most of the Northern men arrive with samples of ore, maps, and in some instances reports made by mining engineers and certificates showing smelter returns. It is the season when the daily newspapers are filled with interviews given by the Alaskans and Klondikers in which the attractions, accessibility, and general information relative to the Northern camps are fully described and consequently the general public rather naturally consider that they know something about the Far North and are competent to form judgment and make investments in mining propositions brought before their attention. The present winter, owing largely to the high price of copper, has been an exceptionally good season for the owners of mineral claims to negotiate bonds and in some instances receive cash payments for their properties.

The most fashionable locality just at present is Knight's island on Prince William sound, where a large number of locations were staked during last summer and early autumn. This island being situated on the sound between La Touche island and that portion of the mainland where the Ellamar mines are situated, is receiving much attention, because the prospective seller can so easily produce his map and show that the mineralized zone traverses the island. It is a fact, however, that a large number of outcrops of chalcopyrite have been discovered, many of which promise to develop into copper mines of value, but up to the present time the development work performed has been quite limited in extent and about the best that can be said is that many of the prospects possess great possibilities. There is no doubt but that during the coming season really earnest attempts at development will be made on several locations not only on Knight's island, but also in other parts of the Prince William sound district.

Although up to the present time only two mines have been regular shippers, namely, the Robertson-Beatson mine on La Touche island and the Ellamar mine on the mainland, about 26 miles southeast of Valdez, yet there are many promising prospects on Galena and Landlock bays near the Ellamar, also several on La Touche island. In fact, there is apparently a mineralized zone extending practically the entire length of this island, and during the summer of 1906 there were six properties being worked in addition to the Robertson-Beatson.

All of the copper camps in the Prince William sound district are comparatively new. The first location, the Ellamar, was staked in 1897 and a little later the Robertson-Beatson property was located. The high grade of the ore and the great showing, especially on the later location, soon attracted experienced prospectors to the district. That portion surrounding Copper Mtn., which is a prominent landmark a short distance from the Ellamar mine, and which can be approached on three sides by water, was especially favored and was soon covered by location stakes. Several reasons, of which lack of capital was the foremost, combined to retard development so that until last year such work had been practically limited to the annual assessment, but during 1906 more earnest effort was put forth, especially by W. A. Dickey; Steel & Burke; Ryer & McDonald; Putz, Steinmetz & Eagan; the Reynolds Alaskan Development Co., and B. F. Mailard, all of whom were ambitious to place their properties in the ranks of shipping mines. Mr. Dickey made some shipments from Landlock bay, but, owing to litigation, he was not able to push work as fast as he desired.

To jump from Prince William sound southeasterly to Vancouver island is a long distance, but, when I started this communication, I did not intend to go so far afield but rather to confine myself to that portion of British Columbia where very many good prospects have been located since 1898 and some copper mines successfully operated, especially the Tyee on Mt. Sicker. This company has smelted nearly 200,000 tons of ore taken from the Tyee mine in its smelter at Ladysmith; and during the present year, in addition to smelting ore from that mine, the company will be treating the same character of ore from the Richard III, which adjoins the Tyee on the east, and which, after lying idle for about three years, is again being actively operated.

Just at present only two copper mines on the island are working, but during the fall of 1906 the property known as the Black Prince group on Sidney inlet, on the west coast, was bonded by the owner, Edgar Dewdney, to the Alaska & Northwestern Copper Co., of Seattle, which will prosecute development vigorously. There is also a good prospect that the property owned by Thompson, Tolmie & Donaldson at East Sooke, on which there is an excellent showing of chalcopyrite ore of good grade, will be bonded to responsible parties in the near future, when operations will be again resumed. There were some 400 tons of ore mined from this property from an open-cut about four years ago, all of which remains on the dump, notwithstanding that it only requires three-quarters of a mile of surface tramway to connect the mine with deep water at Sooke harbor and that the ore will probably average about 10% copper. The owners have preferred to have the ore on the dump, at any rate until the mine was sold.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

ZINC is generally determined quantitatively in the laboratory by titration with potassium ferrocyanide, using uranium nitrate as an indicator.

TUFA is a cellular deposit of mineral springs, usually calcareous or silicious. The name is not to be confused with tuff, which is the name given to the finer, fragmental ejectments from the explosive eruptions of volcanoes.

JAMES J. HILL recently claimed that the passing of 44 trains per day over the tracks of the Great Northern Railroad constituted a record. It is a fact, however, that during the Comstock boom the Virginia & Truckee Railroad carried as many as 46 trains per day to Reno.

ALUM-SHALES are shales charged with alum, which in favorable localities may be commercially leached out and crystallized. The alum results from the decomposition of pyrite, the sulphuric acid thus produced reacts on the alumina present, yielding the double sulphate, which is alum.

GLASS is considerably stronger than granite, except in the matter of crushing, in which they are about equal. The tensile strength of glass is from 2,500 to 9,000 lb., the crushing strength 6,000 to 10,000 lb. per sq. in., and a piece one inch square, and one foot between end supports, breaks under a centre-load of about 170 pounds.

THE electrolytic method for the determination of copper is the one most commonly used now by the smelters and large copper companies. The crucible method is still in use for high-grade concentrate. The colorimetric method is an easy and rapid way for approximate results, especially on low-grade material. The cyanide method is a good one, and is much used, it consisting in obtaining the copper in a blue ammoniacal solution, and then estimating the amount from the quantity of standard solution of potassium cyanide required to destroy the blue color. The titration with sodium thiosulphate is recommended as an accurate method, this process being known as the iodide method, and said to be more practical than, and nearly as accurate as, the electrolytic method.

AMYGDALOIDS are cellular lavas, whose cavities, caused by expanding steam bubbles, resemble an almond in size and shape. The name is derived from the Greek word for almond. Basaltic rocks are most apt to develope these cavities. The term is used in the form of the adjective, amygdaloidal, and properly should be limited to this. As a noun it is employed for secondary fillings of the cavities, which are usually calcite, quartz, or some member of the zeolite group. Amydaloidal rocks are of chief interest on the Keweenaw peninsula, Lake Superior, where certain basaltic lava sheets have their amygdules filled with native copper and are important sources of the metal. Amygdaloidal cavities are often limited to the upper and lower portions of the lava sheets.

SODIUM AMALGAM is used to some extent in mills. It will decompose the salts of the metals, forming an amalgam of the metal and mercury. To make sodium amalgam, clean dry mercury is heated gently, and pieces of sodium about the size of a pea are added slowly, until a soft, putty-like product is obtained. It should be kept dry and away from the air, preferably under naptha. This amalgam has a powerful reducing action, reducing metallic salts to the metal, and thus eliminating these causes of flouring. It is fed into the battery with the mercury, but as it causes the base metals that have been reduced from their salts, to go into the mercury, it often does as much harm as good, and is not in general use. Metallic sodium may be purchased from any standard dealer in chemical supplies.

AS TO the question of removing water from a shaft with a syphon, where plenty of fall is to be had, it could be done, provided the shaft were not too deep. The theoretical height of the water-column that the air-pressure will sustain is about 33 ft., but practically it is only about 28 ft., varying, of course, with the altitude. The diameter of the hose or pipe is immaterial, but the flow will continue only until the level is reduced to the height of the highest end of the syphon, and only when the vertical height from the highest part of the syphon to the lowest level to which the reservoir may be drawn does not exceed 28 ft., which would only admit of lowering the water eight feet more in the case cited by our correspondent, where the water is within 20 ft. of the collar of the shaft.

IN reply to the question of cleaning mercury, impurities may be removed by distillation, which, however, does not always eliminate the most volatile foreign metals, such as lead and zinc. It is best to distill at a low temperature, in a current of superheated steam, in order that globules of the impurities may not be carried over with the mercury vapor. The most general plan is to purify by treatment with dilute nitric acid, allowing it to digest for 24 hours. One part of acid to three of water is the best proportion. It is a good plan to keep mercury, after treatment of this kind, in a glass or earthenware vessel, under a layer of weak potassium cyanide or dilute nitric acid, and draw it off when needed, through a cock in the bottom, and wash with water before using. The principal impurities are the base metals, such as lead, copper, iron, zinc, bismuth, arsenic, and antimony. Impure mercury is recognized by the fact that it leaves a tail behind it in flowing down a glass plate in pear-shaped globules, and it will leave a film on rough blotting paper.

IN reply to the question: Is a placer location good located 1,500 ft. by 600 ft. on surveyed land, when local custom has been to locate on legal sub-divisions of 20 acres to one man, and 160 acres to a company of eight names?

The answer is as follows: There is no law in California requiring either the posting or recording of a notice of location, consequently no rule by which the validity of a notice can be tested except by applying general principles announced by the Land Department or the Courts of States having laws regulating the subject.

The later rulings of the Department of the Interior uniformly reject the notice of a placer location on surveyed lands which does not describe some legal sub-division of the public surveys. A description by metes and bounds not conforming to the rectangular legal sub-divisions would be rejected, as the basis of an application for patent. This rule has at times been relaxed where the claim lies in the bed of a stream or gorge with precipitous cliffs for its sides, which are practically inaccessible, for example, the Grand Canon of the Colorado River. But otherwise it is rigidly enforced. The Supreme Court of California has on one occasion, at least, given to the law a somewhat more liberal construction (142 Cal. 404). But even applying such liberal rule, the notice in question falls short of the requirements as the basis of a patent application, or of a record, if such record is authorized by local rule or custom.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Dredging in Montana.

The Editor:

Sir—In a communication from Mr. C. W. Purington, in your issue of July 28, 1906, is the statement: "In the United States proper, with the exception of the operations already noted in California, the public knows of no profitable gold dredging, from authenticated published statements, although in Montana, Idaho, Arizona, and Colorado dredging operations have been attempted, and there are rumors that some dredges have been made to pay."

As to "authenticated published statements" I cannot speak, but it is a well-known fact that the first successful placer dredges operated in the United States were at Bannack, Montana, and that the present operations of the Conrey Dredging Co. at the lower end of Alder gulch, near Ruby, Montana, are attended with good profits, although no figures can be obtained, the concern being a close corporation.

ALEXANDER LEGGAT.

Butte, January 23.

Mr. Lamb and the Butters Filter.

The Editor:

Sir.—In a recent number of the PRESS*, Mr. Mark R. Lamb, of the Butters Co., has criticised a comparison I made† of the Moore and Butters filters as applied to conditions at the Liberty Bell mill. Mr. Lamb claims that my comparison was unjust and unfair to the Butters process, and goes on to say that instead of the one I made, a comparison with the Butters installation for the Tonopah Mining Co. at Millers, Nevada, would be in order.

Since reading Mr. Lamb's article I have obtained additional information covering the points raised, and in the light of that information I am forced to doubt Mr. Lamb's data and question his conclusions. Mr. Lamb does not state specifically that all of his data are from the plant at Millers, but, as that plant is one of the latest of the Butters installations, it presumably represents the best Butters practice, and it would seem fair to examine Mr. Lamb's statements and conclusions in the light of facts pertaining to that plant.

Mr. R. Chester Turner, superintendent for the Tonopah company, and Mr. A. R. Parsons, mill superintendent, have kindly furnished me information about the Millers plant, which is given below in parallel column with Mr. Lamb's statements:

	Lamb.	Turner & Parsons.
Capacity of filtering vats	Not given	9,130 cu. ft.
Size of filters	5 by 10 ft.‡	4 ft. 9 in. by 9 ft. 9 in.
Number of filters	216	192
Time required to transfer pulp	10 minutes	20 minutes
Time required to fill vats with water	10 "	20 "
Discharging cake	10 "	Not given
Running back water	Not given	20 minutes
Running in pulp	10 minutes	20 "
Maximum height of lift during transfer of pulp and water, by centrifugal pumps	10 feet	25 feet

It would have seemed in order for Mr. Lamb to have made sure of his own ground before attacking the statements I made.

In a personal letter he admits the fairness of my assumption, that, with the same slime, the loading and washing periods and the vacuum required, etc., can be figured the same for both processes. Let it be assumed then that Liberty Bell slime is to be handled by a plant built of the same units as at Millers. The treatment cycle would be as follows:

Loading	60 minutes
Running out pulp	20 "
Running in water	20 "
Washing cake	60 "
Discharging	15 "
Running out water	20 "
Running in pulp	20 "
Total	215 minutes
Total time of cycle	3 hr. 35 min.
Total number of cycles	6.7 per 24 hr.

Mr. Lamb states that 250 leaves or filters like the ones installed at Millers "would easily handle the mill output (Liberty Bell) of 350 tons per day." As stated in my previous article, 45 changes of the Moore baskets are now necessary to handle that tonnage. Each basket has 66 filters 6 by 8 ft., giving a filtering area of 6,336 sq. ft. per basket. With 45 charges, then, we would have 285,000 sq. ft. of cake formed. The 6.7 cycles of the Butters unit, under consideration, would represent 59,563 sq. ft. of cake formed, as the 96 filters have an area of 8,890 sq. ft. To handle, then, the Liberty Bell tonnage would require 4.79 vats of the size at Millers, or 460 leaves instead of the 250 that Mr. Lamb gives as a sufficient number, or the 330 Moore leaves now doing the work.

Again, Mr. Lamb states that one properly designed box for 250 Butters leaves will contain approximately 7,000 cu. ft. If this is so, why were not the Millers boxes properly designed? The two contain only 192 leaves and have a capacity of 9,130 cu. ft. These two boxes have an aggregate filtering surface of 17,780 sq. ft., which gives 0.51 cu. ft. of box per square foot of filter. The Moore boxes at the Liberty Bell have a capacity of 3,050 cu. ft. each, as stated in a previous article, and one basket has 6,336 sq. ft. of filter surface. This gives 0.48 cu. ft. of box per square foot of filter. It would seem from this that the Moore boxes at the Liberty Bell are rather better designed for Butters process work than are the boxes installed by Butters; and Mr. Lamb's contention that "it is certainly not fair to require the handling of the large quantity (of slime) needed to fill (the Liberty Bell) filter vats, which are not designed as in the Butters filter-box, to contain barely enough slime to cover the leaves," rather falls to the ground. These boxes are of the same general design, that is, they are rectangular boxes with hopper-bottoms, having a 60° slope.

Mr. Lamb advocates the use of one large filter-box for the Liberty Bell, instead of the units at present in use for the Moore process, and says that one 9-in. pump would probably handle the pulp in 10 minutes. For a box containing 250 Butters leaves, the capacity would be 11,800 cu. ft., if it were of the same design as the boxes at Millers, instead of the 7,000 cu. ft. given by Mr. Lamb. The amount of pulp and water to move would be about 1,900 cu. ft. less on account of the displacement of the loaded filters, giving 9,900 cu. ft. of material to handle. If we accept the statements of pump manufacturers—and the capacities of their pumps are probably not underestimated—a 15-in. discharge pump would be necessary to move this volume of material in ten minutes, or a 12-in. pump in 20 minutes. If we put our 460 leaves in one box, a 15-in. pump would be necessary for moving the pulp in 20 minutes, and a 20-in. pump necessary to do it in 10 minutes.

His proposition to use a single large vat also involves the condition of maximum power consumption where power is bought on peak load.

Mr. Lamb's statement that "as 48-in. pumps are regularly used to transfer sand in dredging, it is hardly in order to call a 9-in. pump 'large' or to consider it or its valves difficult of operation," scarcely calls for comment.

*MINING AND SCIENTIFIC PRESS, January 12, 1907, page 54.
†MINING AND SCIENTIFIC PRESS, December 15, 1906, page 714.
‡Given in personal letter to me.

It is safe to say that where a 48-in. pump is regularly used for dredging sand, it is not used in connection with a nest of 48-in. valves.

Mr. Lamb asks why a gravity plant could not be placed at the Liberty Bell. The answer is, for the same reason probably that it was not installed at Millers. It would cost more to excavate for it than it would be worth.

In a personal letter, Mr. F. L. Bosqui has pointed out wherein my former article was seriously incomplete, by not giving comparative cost data for filter-repairs and maintenance, for the Butters and Moore systems. Mr. Bosqui's criticism is entirely just. I could not give these data, as I have not got them. Such as I have on the Moore process, are vitiated by two factors, namely: At Bodie, the plant was run several weeks without regrinding, and the heavy sand rapidly cut the filters to pieces, and raised the costs materially for the period covered by the data I have. At the Liberty Bell, the filters are being changed as rapidly as may be to a better type, in part similar to the ones at Bodie, and repairs make consequently a large item. Experience seems to indicate, though, that filter-repairs are less for the Butters than for the Moore process.

EDWARD H. NUTTER.

Telluride, January 30.

The Production of Copper.

The Editor:

Sir—In reference to your editorial remarks concerning the failure of the Lake Superior copper mines consolidation and your restrictions on the operations of Messrs. Cole and Ryan, may I suggest that there is one view of the question that possibly has escaped you.

The world's known supply of copper is, and has been for many years, limited and today there is no great expectation of huge discoveries to be made. The supply of copper, either native or as an ore, is not, like iron, relatively unlimited and dependent only on the size of the reduction works for its output. And yet in no industry has so foolish a policy been followed for the last thirty years as in the production of copper. When the price went down, owing to decreased demand, every company strained itself to the utmost to increase its production so that its net earnings might remain the same, this only accentuating the difficulty and still further depressing the price, till we had the spectacle of a metal costing nine cents per pound to produce selling for 11 cents. On the rebound we have copper selling at 25c. per pound, a price which both producer and consumer agree is too high, and yet it has been forced upon the community by the extravagent production of the metal in the past five years.

Can anyone uphold the action of Col. W. C. Greene in his riotous output of copper from Cananea without profit to his company in the early days of that camp, when silicious ores were smelted with coke transported by wagon from the United States instead of being kept in reserve until ready for concentration by water after rail communication had been established? Does anyone uphold the carnival of crime and debauchery rampant in Butte for ten years during the Heinze regime? Yet this last blot was removed by Messrs. Cole and Ryan, and in their taking hold of the Greene and placing Mr. L. D. Ricketts in charge, that property may at last be put in such shape as to pay dividends to its stockholders and not be the mere football of interested parties.

Although I have said that iron is unlimited, even that is but a relative term, and the closer association of iron producers in the United States in the last five years has given a steadiness to the trade and a production more nearly dependent on the consumption. In copper we have had a consumption dependent on production and I believe that a better understanding among copper producers of the conditions of the market and the elimination of petty jealousies by centralization of control will do wonders toward establishing a steady price for that metal, not as low as 11c. nor as high as 25 cents.

If Messrs. Cole and Ryan can accomplish this result, they will receive the thanks of the industry and they are welcome to whatever they can personally make in the steadying of values of copper and copper mining stocks.

OSSIPEE.

New York, February 8.

Modern Gold Milling.

In the modern plants a good deal of attention is being paid to securing good and substantial foundations for the apparatus, and especially the stamp batteries. Liberal use is made of concrete for this purpose, and the foundation work is sometimes very costly, but the increase in cost is more than made up for by the solidity and freedom from jarring and vibration of the building. In regard to the battery foundations, modern tendencies are overwhelmingly in favor of the concrete foundation. The prejudice which unquestionably existed in the mind of many managers, even men of wide experience in stamp-mill practice, against the concrete foundations, seems to be fast disappearing.

It is quite true that the opponents of the concrete foundation could point to instances where the foundations had not given satisfaction, but the greater part of the trouble was undoubtedly caused by the unfamiliarity of the men who built the foundation, with the kind of material required for this work, and perhaps their unfamiliarity with concrete work in general. It is not always easy in far-away mining regions to secure men particularly fitted for carrying out a delicate job of work which requires care and attention, as concrete work undoubtedly does, and the tendencies to carelessness in the working of the material and the proper mixing and proportioning of the ingredients are always present. Moreover, a good deal of care is required in getting the battery mortars to bear evenly with their lower surface on the top of the concrete foundation.

The interposition of a sheet of rubber to cushion the blow is, of course, an additional safeguard in this respect, but it is much more advisable to pay careful attention to the leveling of the top of the foundation and to use a comparatively thin sheet of rubber than to rely upon a thicker intervening layer. A well-built concrete foundation is sure to last indefinitely, and to cause much less trouble than a wooden foundation, which latter is undoubtedly the weakest point in the battery, and a source of considerable trouble when it needs repairs and renewals.

A point to which particular attention should be paid in the construction of concrete foundations is that the proper amount of cement should be allowed in the mixture. This is one of the instances where it does not pay to save on the cement and use too high a proportion of inert materials. It should always be remembered that the cement is the only material that holds the concrete together and gives strength to the mixture, and that a structure which is so much subjected to vibration and strains as a battery foundation is, needs to have considerable strength. The tendency, of course, to cheapen the cost of the concrete by decreasing the amount of cement is always present, especially when the work is done by independent contractors. One instance of such a procedure came to the notice of the writer, where the battery foundation had cracked on account of the poor material used by the contractor, and had to be largely replaced.— George P. Scholl in *Electrochemical and Metallurgical Industry.*

A Question of Mining Law.

As usual at the beginning of the year, in any gathering of mining men there is apt to be some kind of an argument regarding the mining laws as they affect the rights of one location over another. The editor of this journal is sometimes asked to decide the controversy. A recent inquiry is stated thus:

A locates a mining claim in June, 1905, claiming 750 ft. easterly and 750 ft. westerly, does his location work, and records; but in the year 1906 he fails to do his $100 worth of work, and virtually abandons his claim. In August, 1905, *B* locates a claim as marked in dotted lines, and claims 200 ft. easterly and 1,300 ft. westerly. He does his location work, and records, and in 1906 does his necessary $100 worth of work. Does that portion of *A*'s claim become *B*'s ground when *A*'s claim reverts to the Government on the night of December 31, or if *C* should come along and re-locate *A*'s claim, would he be entitled to all that *A* had formerly owned? Some assert that *B* never had any right to claim 1,300 ft. of *A*'s ground originally, and would have to make an amended location to get that ground, which in this case would make him put up his amendment on the night of December 31, as at that time *C* was going to re-locate *A*'s claim. Others argue that if *B*'s claim ran in an opposite direc-

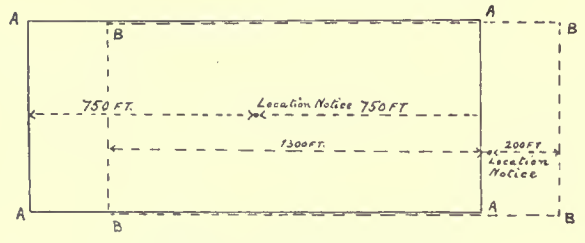


Diagram of Conflicting Locations.

tion and ran into *A*'s side lines, instead of his end lines, that upon *A*'s claim reverting to the Government, it would belong to *B*.

The question raised by this inquiry is one of the most important arising under the mining laws, as well as the most difficult to answer. It embarrasses the bench and bar alike and involves in its consideration problems which the press, lay, scientific, or technical, should not attempt dogmatically to solve. We may be permitted, however, to present briefly the state of the decisions and in a tentative way suggest certain deductions.

The Supreme Court of the United States in Belk *v.* Meagher, 104 U. S. 279 (1881), held in terms that a location can only be made where the law allows it to be done; that any attempt to go beyond that will be of no avail. Hence a re-location on lands actually covered at the time by another valid subsisting location is void, and this not only against the prior locator, but all the world, because the law allows no such thing to be done.

For many years, and by an unbroken line of decisions the courts of the mining States, both State and Federal, held that under this decision of the highest Federal tribunal a junior location which overlapped a valid subsisting senior claim was absolutely void as to the conflicting surface area, and that the only method by which the junior locator could acquire such surface upon abandonment by the senior was to amend his location, after such abandonment, and include the abandoned area, or to state it in the form of a postulate; where a junior location conflicts with a senior, the conflicting area did not, on abandonment of the senior location, enure by gravity to the benefit of the junior.

However, in the later case of Lavagnino *v.* Uhlig, 198 U. S. 443 (1905), without a reference to or a comment upon its earlier decision in the Belk-Meagher case, the United States Supreme Court announced what appears to be a doctrine diametrically opposed to the old rule. This later expression of views of that tribunal may be stated as follows:

"Upon the forfeiture of the senior location prior to the junior locator's application for patent the conflict area enures to the benefit of the junior locator, and one who locates the senior claim after it has become subject to forfeiture cannot successfully adverse the junior locator's application for patent."

This quotation is taken from an excellent dissertation on this subject in a note to the case of Wilson *v.* Freeman, Book 68 L. R. A., p. 843.

The Supreme Court of Idaho sums up the situation as follows:

"It has been generally understood throughout the mining States that Belk *v.* Meagher had become the settled law, to the effect that no valid re-location can be made on a mining claim until the rights of the former locator have been finally forfeited or abandoned, and that a location made after the forfeiture or abandonment would take precedence over such invalid re-location; but Lavagnino *v.* Uhlig, decided less than a year ago, appears to have been entirely upset by that doctrine, and it will be a matter of great interest to lawyers and courts, as well as the miners of these Western States to know just whether these cases are distinguishable on principle or the one overrules the other entirely."

Ambergris Min. Co. *v.* Day, 85 Pac., p. 114.

The mining lawyers of the West are practically unanimous in the view that the later expression of the Supreme Court of the United States is wrong in principle, and based upon erroneous or fallacious reasoning. An able statement of the prevailing dissent from the later revelation will be found in an elaborate note in Book 68, L. R. A., p. 843, heretofore referred to.

To recur now to the inquiry of our subscriber. If we assume that the later decision must be construed as a practical reversal of the former, and that the two cases cannot be distinguished or differentiated, we may deduce the following reply:

If in the case as stated in the inquiry, *B*'s discovery is on free ground, the conflict area will fall by gravity to *B*, without any affirmative action on his part, as soon as *A* abandons his claim or fails to perform his annual work; *C*'s location would be void as against *B*. If *B*'s discovery should be within the conflict area, *B*'s location would be void and *C*'s would prevail.

On every mine where drills are extensively used, a fitting shop, or a large section of one, will be set aside for their upkeep and maintenance. It will be found a good plan to have each machine brought up once a month, that it may be thoroughly cleaned and wear taken up before it increases. Most of the wear, especially on exposed parts, such as the feed screw and nut, is due to the mixture of grit and grease in which these parts work; unless this is cleaned off at frequent intervals, both the life and efficiency of the machine are impaired. The simplest plan, and one saving considerable labor, is to place the dismantled parts in a vat of soda solution, kept at boiling point by a steam jet, or other means.

The features desirable in a rock-drill are reliability, dead blow, variable stroke, portability, compactness, protection, and interchangeability of working parts, and provision for taking up wear. Most machines combine these points to a certain extent, while no drill excels in all of them.

Cornish Tin Mining.—II.

Written for the MINING AND SCIENTIFIC PRESS
By H. E. WEST.

The Cornishman has been a miner from time immemorial and he is to be found following his calling wherever mines are being worked. The labor available in Cornwall today is barely adequate for present requirements and quite insufficient for any wholesale re-opening of the old mines. Doubtless, many miners will be tempted to return, especially as the price of labor is likely to increase. A miner working full time for the month works but 24 shifts of eight hours. Of course, the mines are somewhat deep and bad ventilation must also be considered. In the Western States, however, a miner calculates to work every day in the month, and, as often as not, longer than eight hours, his remuneration being usually $3.50 per shift. Labor is divided into contract and day labor, the former being again subdivided into two classes, 'tributers,' or 'tut-work' men, and 'owner's account men,' as day's-pay men are termed.

In Cornwall, miners underground do not usually work too hard; in fact, for actual honest work done, the shift is below the average, taking miners at large; and, in the contract settings, great ingenuity is displayed to get the best of the agents or 'shift-bosses,' any scheme being deemed honest to secure the looked-for ends. As an average 24 shillings per week is earned by a miner, some men making 30 shillings. This is a low pay for skilled miners, but, were more work performed, more remuneration could be offered. In this the 'agents' are probably as much at fault as the men, owing to the tendency to cut the price of a contract should a pair of men do rather better than usual—hence the resort to cunning, and, at times, practical dishonesty.

Probably as 'double-hand' drillers Cornishmen cannot be excelled. At times, in the stopes, one man may turn the drill or 'boyer' to four strikers, whose blows fall in quick succession with the full round swing of the heavy hammers. Air-drills of local manufacture, and built to withstand any ill treatment, are used mostly in development, such as driving ends. Stoping is usually by hand and is let to contractors, either at so much per ton, or so much royalty on the ore raised.

Stoping is conducted both 'under' and 'over-hand.' The 'walls' are usually firm and timber is omitted, especially in the wider stopes, or 'gunnies,' which are so wide that stulls would be impracticable, and square sets are not used in Cornwall. In Dolcoath, about the 400-fathom level, there are some stopes so wide and high that neither wall nor roof is visible. In places the floors of levels have been beaten away, and swinging platforms are constructed, sustained by wire-ropes, or chains, hung from bars driven into the walls. From such platforms, to the light of the candle, nothing is visible but an appalling abyss of darkness. Such places are not altogether safe, as is testified by some extensive 'runs' in the past. To one accustomed to weak walls, the frequently complete absence of either timber or filling seems incredible. Pillars are left, usually in the poorer portions and, of course, the levels are protected by strong stulls, driven firmly into hitches, lagged over and filled.

In the Stope of a Cornish Mine.

Taking Dolcoath as a type of Cornish mines, it is noteworthy that the vein was worked for copper in the upper levels; then came a barren zone, causing despair to the 'adventurers' of those days, and all but the abandonment of the mine, until finally tin was struck, and it has continued to the present day. It is hard to conceive of tin having once been present in the upper portions, or 'gozzan,' of the vein.

Copper compounds are readily soluble in solvents contained in surface waters, as is proved by the leaching of

copper in the zone of oxidation and the precipitation of it below in the zone of secondary enrichment. Tin, occurring practically only as the oxide, is attacked only by a few solvents, and those are not present in any quantity in surface waters. At the 470-fathom level, now being driven and affording practically the lower development on the lode, ore is being raised that carries 1¼ cwt. cassiterite per ton, equivalent to 6.2%. This, of course, is a most excellent grade with tin at over £150 per ton. The increase of heat with depth is not excessive in most mines. In some, thermal springs have been encountered that would render deep sinking impracticable. But, considered all round, provided the ore is payable, no mining or mechanical difficulties will prohibit such mines as Dolcoath being worked to 5,000 ft. vertical. All Cornish mines are burdened with water. In the earlier working of the mines, adits of great length—twelve miles or more—were driven to drain the seepage and to lessen the lift of the pumps. Cornish pumping engines have done good service in the past, but with deeper sinking the Cornish system of raising water is too cumbersome and costly. Today, and in the future, economic requirements call for high-lift electrically driven pumps, either plunger-driven, or the multi-stage centrifugal.

It is instructive to look at practice elsewhere. Take, for example, the Difficultad pump at Pachuca, in Mexico, where the large compound Cornish pump, with a three or four-foot rising main, calculated to raise 5,000,000 gal. daily from a depth of 1,000 ft. below the adit, is displaced by a four-step centrifugal pump, operated by a 750-h.p. asynchronous motor, and with a pump-column of not more than 16 in., still taking care of the water and with a minimum amount of stoppage, which is an important factor in mine pumping. Cheap power will, therefore, be required for deep and comprehensive working in Cornwall; for pumping, winding, stamping, etc., necessitate large supplies of power, and electrical drivage is the best adapted for all purposes underground and at surface.

Looking further into the mining and treatment cost, it is recognized that further economies are possible with modern facilities for the production of 'black tin.' Underground, as far as the actual costs of development and stoping are concerned, expenses are possibly almost as low as the scale of operations will permit. Standing charges, such as pumping and winding, could be lessened with electrical power. Tramming for long distances could be cheapened by the use of electrical locomotives. In new shafts large loading-pockets with self-dumping skips, hauling four to six tons with a winding speed up to 3,000 ft. per min., would lead to further economy. With small crooked shafts—as at many of the mines today—haulage is costly because of the small output and low speed, and in these cases it is unavoidable. Surface traction for ore could be amended by electric traction or belts. Preliminary breaking, sorting, and gradual reduction of ore before passing into the mortars might be amplified, enabling the stamp-capacity to be increased. Adequate slime-saving plant would increase extraction and cut down losses at present passing over the tin-streamers. The attempt to smelt concentrate at the mine and market pig tin in place of black tin would be doubtful, the advantage of the suitable mixing of black tin of different grade and constituents lying with the smelters. The capacity of most mines could be further increased, which, other things being equal, would lessen the cost per ton of ore treated.

Taking Dolcoath as an example, where the tonnage raised and milled is 269 tons daily, or 8,000 tons monthly, producing 145 tons monthly of black tin, or 40 lb. per ton of ore crushed, worth £91 17s. 11d. per ton: For the six months ending December 31, 1905, the receipts per ton were: £1 12s. 10¾d. The charges were: Working cost £1 2s. 6¾d., royalties 1s. 1¼d. Total, £1 3s. 8d., giving a profit of 9s. 2¾d. per ton treated. It is noteworthy that the tonnage treated has been doubled since 1895 and the ore-value lessened by one-half. In 1895 the product per ton was $79.19 per ton of ore crushed, with 4,800 tons milled monthly. The profit for the last half-year was stated at £22,385. No detail of working costs is available and, therefore, it is impossible to more than surmise at economies. A total working cost of about $5.50 compares favorably with gold mines of from two to three times the output. Labor costs are low in Cornwall compared to many camps abroad. Labor is likely to appreciate in value, and so, in order to maintain the same working costs, economies must be effected in one or more of the stages of production or the percentage of extraction must be increased, In order to render payable an ore of similar grade to that at present mined.

Taking all things, therefore, into consideration—realizing the possibility of tin being over £150 per ton for some years—and at the same time not forgetting that this price will stimulate and increase production all over the world, causing £100 per ton to be reckoned as a more conservative standard, the demand for the metal is such that the price cannot well drop before many an old mine is resuscitated in the county of Cornwall. Many mines are indeed already being re-organized, and some are already in actual work, as for instance Wheal Vor in the Breage district, said at one time to have supplied one-third the tin produce of the world, and still not one-half the depth of Dolcoath. It is extremely doubtful, however, if the movement will spread so far as to re-float all the stranded wrecks that lie from Dartmoor to the Western Cape. That a wholesome revival will take place, is assured. It must be borne in mind that most of these mines stopped, not because of any marked falling off of mineral contents, but rather on account of the low price of tin—insufficient to make expenditure and income meet. This is now happily changed, "tin is up," and the event has speedily reacted on Cornish mining. There is no knowing when the movement may stop. Increase of production is possible, and, on the other hand, there is no knowing when a period of financial stress may paralyze trade and, by lessening the consumption of the metal, bring down its price again below the payable limit for the lower grade mines. Increased efficiency and lessened costs will doubtless be attained if capital in sufficient quantity be forthcoming, all of which will enable lower grade ore to be more remuneratively worked than ever before.

Cornwall is awakening, it is attracting the attention of outside capital, the 'cost-book' system is doomed and giving place to 'limited liability' companies. Comprehensive working, modern plants and concentrators, and able administration, will do much to re-establish the industry and give new life to many a barren hillside and lonely moor.

IT is patent that the rock-drill has to fulfil numerous requirements, many of them so conflicting that a compromise is the only possible result. For instance, it must strike a dead, uncushioned blow, and yet work with a variable length of stroke; but to comply with the latter condition the valve must be capable of reversal before a long stroke is completed. It must be strong enough to stand rough usage and yet be light as possible. This means the factor of safety must be cut fine to ensure portability; for it is one thing to carry 200 lb. on a turnpike road, and quite another to drag the same weight up a steep, slippery stope. Compactness is equally essential, as the angle that can be bored in a confined space is chiefly decided by the over-all dimensions of the machine.

Death Valley.

By Robert H. Chapman.

*The area lying to the west and southwest of Salt Lake, as far as the Sierra Nevada, was for a long time known as the Great American desert.

The discovery of gold in California in 1848 was the beginning of the conquest of this thirsty region, the direction of greatest travel being but little south of west from Great Salt Lake to the vicinity of the Donner pass in the Sierra Nevada, since used by the Central Pacific railroad in crossing the range. In seeking for better routes to the new El Dorado, parties journeyed southward across the wastes of sand and rock searching for lower passes that would be perennially available. In this direction the number of mountain ranges to be crossed is largely increased, but by going well southward the great wall of the Sierra Nevada is escaped, though the desert journey is lengthened and the hardships encountered by many parties were most appalling.

Death Valley.
From the Summit of Grapevine Range.

The desert took frequent toll in the lives of man and beast, and indeed does sometimes today, though the dangers are now comparatively insignificant.

With the discovery of the Comstock mines there came a period of tremendous activity in the search for the precious metals, more particularly for silver, and much of the desert region was traversed by the hardy prospector and his burro. In this way the long distances between watering places were divided by the discovery of springs and 'tanks' (natural reservoirs), and gradually this part of the desert diminished in area and lost some of its fearfulness.

In the '60s and in 1871–72, government expeditions under Lieut. George M. Wheeler traversed several routes across the desert, making topographic sketches and notes of interest, but few complete maps were printed. In 1865, and several times since then, the boundary line between Nevada and California was run, which cut through much of the most difficult country. The reports of members of these expeditions did not tend to populate the region with great rapidity.

In many instances prospectors were successful, and the camps of Silver Peak, Lida, Reveille, and others sprang up, and had their periods of prosperity and decline, becoming completely uninhabited.

During the period of activity many travelers became permanent residents, took to wife dusky maidens from the Indian tribes, and started ranches at various springs and streams, oases in the expanse of waste, where small herds of cattle or horses were maintained.

On the east the Mormons pushed gradually away from the streams of southern Utah and established farms and ranches at such places as furnished water, but there is a belt of country one hundred miles or more in width between these points and the water-fed valleys at the foot of the Sierra Nevada, which is almost wholly barren and very dry.

In Death Valley.
Sand Dunes and Mesquite Roots.

During the last few years, beginning with the discovery of valuable ore at Tonopah (in May, 1900), the attack

*Abstracted from the *The National Geographic Magazine*. Mr. Chapman was in charge of surveys for maps of this region prepared by the U. S. Geological Survey.

upon this desert has been renewed with great vigor and earnestness, and the efforts of the seeker of fortune met with so much success and at such widely separated points that it was decided by the officers of the Geological Survey to put parties in the field to make a reconnaissance of some of the unmapped desert area.

The idea of the average man is that the desert is a great plain, sand-covered or rock-littered, with nothing to relieve the monotony of the horizon. As a matter of fact, these great areas include mountain ranges, high plateaus, mesas, and buttes, extensive valleys, that in the clear air seem but a short distance across. Many of these valleys are 'closed'—have no outlet—and the lowest pass from one to another is often many hundred feet above the valley floor. The flowing streams are very few, the springs far between, and water a commodity for which men search, often with life at stake.

Twelve miles southwest of Bullfrog, camp is made at the Daylight spring, on the crest of the divide between the Amargosa desert and Death Valley. We journey to one of the high peaks of the Grapevine and look into the "Valley of the Shadow of Death," as desolate a view as may be found.

In the distance the Telescope range rises to an elevation of nearly 11,000 ft., while at our feet the salt-white plain is more than 6,000 ft. below us and well below sea-level. The flat is 25 miles away, and on its borders not a vestige of vegetation appears. The valley was named Death Valley from the loss of members of parties of emigrants who attempted to pass through it in 1849, and since then a number of persons have been lost, keeping up the sinister record as a graveyard, but the appalling stories of the number of persons perishing there each year are exaggerated. It is not safe to go into Death Valley for active work during July, August, and September, though there are persons who remain there all summer; but in October we journey from Daylight Spring down hill, mile upon mile. A sign painted upon a box lid stuck into a pile of stones gives us the cheerful assurance that we may be well provided for if we are found; it reads: "Rhyolite Undertaking Company, funeral directors and embalmers."

The cañon walls rise above us, not high, but sharp and steep, and it is only by turning and looking backward that we appreciate the greatness of the range we have crossed. The grade is easy, the road wide, sandy, and gravelly, our horses grow weary and move with deliberation; all are oppressed with the feeling of weariness and lassitude.

We ride from the cañon mouth to the edge of a sandy plain, and here, 115 ft. below sea-level, find a couple of holes, five feet in diameter and about as deep, with two feet of water in them. This is the Stovepipe spring, so named from the fact that it was long marked by a section or two of that useful flue, placed upright, to inform the wayfarer where to dig when the holes had been filled by drifting sands hurled forward by the furious gales, burying deeper and deeper all vestiges of the water so necessary to life itself. We are indeed in *the* Valley; around us the sand drifts in little sheets; here and there a surface of broken and ragged saline material, hard and as rough as though made of giant saws set with teeth edge up.

We turn to the eastward; in the foreground the gritty beds of conglomerate and hard clays show as low hills backed by the ragged cliffs of the Grapevine, banded, rugged, and grim. To the northward the cliffs and peaks guard this valley of desolation, the long delta fans of drift material spreading like great hands from the mouth of each cañon, burying from sight all vestige of the underlying rock, each a silent witness of the cloudbursts, which sometimes come roaring down the rock-bound clefts, to spread and evaporate like magic in the fierce rays of the sun. The farthest fan marks the mouth of Titus cañon, named for the young Coloradan who left Bullfrog about the time we reached Goldfield, and perished in its lower reaches seeking water, as attested by the message penciled upon a sliver of stick broken from a provision box and left sticking in the sand for the guidance of his companions: "Have gone down cañon looking for the spring; have been waiting for you — TITUS." His remains were found; those of the friend are still resting undiscovered.

Across the flat we journey, our light vehicle loaded to its limit with food, forage, and water, the mules weary before starting. Dunes surrounded us, 20 to 30 ft. high, representing the struggle of plant life to keep its branches above the accumulating drift and its root near enough water. The victory is eventually with the sand, into which wheels and hoofs sink nearly a foot, or when a harder surface is found it breaks like crusted snow, letting the beasts into a soft substance which they dislike exceedingly. Through such ground we can move but a few yards without stopping. In places great boulders obstruct the trail, among them the wagon must twist and turn through the fickle and shifting sands which often hide all signs of previous travel.

About 25 miles southward from the Stovepipe spring, Furnace creek flows from the lower part of a large wash which heads in the Grapevine range. Here is one of the properties of the Pacific Coast Borax Co., which years ago constructed small irrigating ditches, sowed hay and planted trees, built houses, and established a plant for the treatment of the salts in the flat near by.

At 225 ft. below sea-level are about 100 acres of emerald-like fields, long rows of fig trees, and abundant running water, while behind the frowning cliffs and sharp peaks of the Funeral range guard the valley from the advance of the treasure-hunter from the East.

The borax plant is now idle, though the valuable beds are still owned by the company, which maintains a resident superintendent or foreman. The white flat which we saw from the mountain is composed largely of salt, borax, and gypsum. The surface is as rough as can be imagined; it consists of ridges, blocks, and plates on edge, inclined, and flat, with shallow drains full of dreadfully salt water. From these drains the mixture of salt and other material is taken, molded into forms, and set up at various places to mark the corners of the mineral claims. This material dries out, and, when the molds are removed, stands like solid marble blocks, which remind one of the fate of Lot's wife. Here we are informed that during the summer the temperature reaches more than 130° in the shade, and that the nights are too hot for sleeping, but during our visit in November the weather was beautiful except during the fierce sandstorms.

Much of the real development in Death Valley has been done by the parties interested in borax, which is found here and in many parts of the desert region. The 'cotton-ball' (borate of soda) is found in the flats, but colemanite (borate of lime) is found in the hills and mountains, high above the flats of the valley bottom. At one time it was attempted to refine borax at Furnace creek, but no work of gathering or treating is now done there. The freight teams of the company bring provisions every few months. From here the now famous 20-mule team hauled to Mojave; such teams are often seen along the lines of communication in the desert, but few have so many animals or such heavy wagons.

There is one way to become famous in Death Valley — that is, to die near to a trail so that one's remains may be found. For instance, meeting a man one day, I inquired about the route, water, etc. He said: "The

road is plain for ten miles, when you'll find a well about 100 yards to the right; the water is salty, but your mules will drink it. Six miles farther you'll come to 'Tim Ryan, Aug. 9th, '05,' and two and one-half miles southeast of him you'll find plenty of good water."

From the valley where, even now in November, the temperature is between 80 and 90° during the day, we cross to the Panamint range. At the mouth of Cotton-

Reveille Range.

wood cañon we halt for lunch, having covered eight miles during the morning, and find numerous hieroglyphics on the walls. These illustrate Indians fighting over water, and depict a running stream, the bighorn sheep, and various animals and birds.

Twelve miles up this 'wash' we find cottonwood trees,

Kawitch and Quartzite Mtn.

some grass, a running stream, and quantities of watercress, which the mules attack with evident relish. Here we find numerous prospectors, learn of an abandoned camp to the north, and water and trails everywhere.

In the Grapevine and Panamint ranges there are still a few mountain sheep. Tracks near water-holes and a few old skulls are the nearest we come to a view of these shy animals.

To the northward we follow along the range, often in sight of our valley camp miles away, and 48 hours after leaving the summit of the valley we are camping 9,000 ft. above it, wading in snow varying from ankle to waist deep, with shoes and stockings frozen hard.

In the Panamint range, both sedimentary and volcanic rocks appear, and near one of the contacts of these we travel up a wonderful cañon. The walls are so near to one another that on horseback one may touch both at once. The material is limestone that has been baked into marble of alternate beds of black and white, about a foot in thickness. This trail is one of the old Indian routes to the Valley from Keeler and the Sierra Nevada.

From the summits of the Panamint range we look into the Panamint valley. Similar to Death Valley in form, but a little higher in elevation, the floor is 6,000 ft. below the mountain tops and about 1,000 ft. above the sea.

Death Valley is by no means the driest of the regions traversed, but the heat and heretofore the inaccessibility have made it difficult. In the mountains flanking it are

Marble Canyon.

numerous springs and frequent water-holes which, though dry in summer through excessive evaporation, are available during the fall and winter. There are many springs that are credited as poison water; one of these we sampled, but unfortunately the bottles were broken before analysis could be made. In my opinion, there are springs in which arsenic is present, but most cases of sickness or death are probably due to drinking excessive quantities at one time, followed by physical exertion in the heat. Such springs as the Indians will not use are better left alone or used in extreme moderation, by no means an easy thing for one throat-parched and speechless for need of water. Each spring is a source of supply for birds, many of which are very tame.

Great mountains are a joy to the lover of nature; they are an inspiration to the artist, and express grandeur and nobility. The desert has no such spirit, but has a wonderful fascination, born of the impressiveness of magnificent distance, limitless sky, and the infinite patience of an unbreakable calm.

Prospecting for Rare Minerals and Earths.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE E. WALSH.

The remarkable strides made in the electrical industry have stimulated a demand for many minerals and earths that were formerly of little commercial value. In the laboratory many of these had their uses, but they were not considered of sufficient importance to attract attention to the mining of them. The electro-chemist has secured results that now give value to deposits containing tungsten, vanadium, uranium, and molybdenum. In searching for some metal that would give better incandescent results than carbon filaments, the electro-chemist has developed a series of rare earths. A good many of these were formerly imported, but today new deposits of them have been discovered, and in some instances the domestic products are superior to those brought from Europe.

The oxides of several rare metals are very refractory, and their use in making glower mantles and incandescent-lamp filaments has created such a demand that it is profitable to prospect for them. Most of the new filaments for incandescent lamps are manufactured from several of the rare earths in such proportions that highly desirable results are obtained. The Nernst lamp, for instance, is composed of 85% zirconium oxide and 15% yttria earths. The latter include a mixture of several oxides that occur together in certain minerals, most of which have a high refractory power.

Until within a few years the yttria earths were obtained almost entirely from the minerals gadolinite and yttrialite in Norway and Sweden. Today, however, the best deposits are found in Llano county, Texas. The deposits found in Texas are in a small district, and are probably the results of volcanic eruption. They are radioactive, and are found in pockets in the quartz. The presence of the earths is indicated by a bluish discoloration from the quartz. It is a simple matter to recover the yttria earths from these deposits of gadolinite and yttrialite, and they make the best lamp glowers used in the trade.

The superiority of the Texas deposit to that obtained from Scandinavia may be indicated in the relative atomic weights. Yttria earths of the greatest atomic weights give the most satisfactory results in glowers. The atomic weights of the Texas ores range from 100 to 115, while the imported ores are as low as 90 to 92. The discovery of other deposits of yttria earths in different parts of the country indicates the possibility that the use of them may modify the development of new lighting systems.

Zirconia has always been used to some extent with gas lamps and mantles, but in the early development of this industry the glowers were made chiefly with stuff that was obtained from chemical supply houses. Uniform results could not be obtained from such material. But now good zircon ore, a zirconium silicate, is found in abundance in Henderson county, North Carolina. This ore contains 67% zirconium as oxide. The ore is mined in considerable quantity and ground fine in a ball-mill with twice its weight of crude acid potassium fluoride. In this condition it is then thoroughly fused in a graphite crucible until the ore is completely dissolved. Reasonably pure zirconium is obtained. Absolutely pure zirconia is not necessary for the electrical industries, but anything more than a few traces of silica would cause a rapid change in the potential difference at the glower terminals and thus diminish the power of the light and shorten the life of the glower.

The development of the tantalum lamp has been due chiefly to the work of securing a material that has a greater luminous efficiency than the carbon filament. Carbon filaments cannot stand the high temperatures required for the best lamps, and the search for a proper substitute has resulted in experimental tests with a great number of rare metals and earths. The experiments with the osmium lamp increased the demand for this metal, but this is quite rare and the price has been greatly against it. The resistance of osmium is comparatively low, and it becomes soft at high temperatures. Tantalum, however, is a metal that has a higher fusing point than platinum, and it can be maintained at a high temperature for a long period. For a lamp for 110 volts about two feet of tantalum wire is used, but the wire is exceedingly thin, and about 45,000 filaments can be made from one kilogram of the metal. At present the cost of obtaining the metal from its ores and drawing it into thin wires determines the price of the filaments in the market. Tantalum is not a rare metal, and it is found in considerable quantities in different parts of the country. But there is a great difference in the purity of the ores. Given the pure metal there is not much difficulty in drawing the wires. It is not easy to extract the metal from its ore. At present the method of treatment is to prepare a mixture of tantalum fluoride and potassium fluoride, which is reduced by potassium, and the product is subjected to fractional distillation. The mass of tantalum thus obtained can then be treated as any ordinary metal and drawn suitable for the trade. The crude material is cheap, but the refined metal is expensive, owing to the cost of recovering it.

The best tantalum-bearing minerals are found in the Black Hills, South Dakota. The deposits there are rich, and while ordinary tantalum-bearing minerals are quoted at $7 to $10 per unit, according to the percentage of tantalic acid contained in them, the best ore from the Black Hills commands $20 per unit; in other words, the ore ranges from $250 to $500 per long ton, showing that the quality of the deposit has an important bearing upon the pure metal in spite of the difficulties of refining. The amount of tantalum used today is comparatively unimportant, but its steady improvement in incandescent lighting promises to effect a great change in this respect.

The other important field in which rare metals are receiving attention is in the iron and steel industries. This is not so distinct from the electrical field as may appear at first sight, for the manufacture or recovery of many of these metals is due to electrical processes. The electro-chemist was the first to discover the peculiarly valuable properties of the ferro-alloys in hardening steel, and the electric furnace has proved an important factor in giving a new value to tungsten, molybdenum, vanadium and uranium. The mixture of these with steel, to toughen and harden it, has become the accepted practice of all mills where special grades of hard steel are made. As a result the demand for these ores has increased rapidly.

Until a few years ago most of the tungsten ores were obtained from mines in Australasia and Europe, and an industry was built up in Germany, France, and England in manufacturing the refined metal. The tungsten ore as mined was seldom used by these European concerns, most of them using a concentrate containing upward of 60% tungstic acid. But the discovery of good tungsten deposits in this country has stimulated manufacturers and miners to renewed interest in the raw product. The largest producing area is in Boulder county, Colorado, but more recent discoveries have been made in Arizona, Idaho, Wyoming, Washington, and California. These deposits show wide variations in quantity and quality, but the richest prove exceedingly profitable. Some of the tungsten metal obtained from these mines analyzes as high as 99%, and when it contains very little carbon it

sells from 75c. to $1.25 per pound. No chemical compounds can equal this for steel-making, and English and German steel makers have begun to consider the wisdom of importing the American metal for their work. It is therefore more than likely that within a few years we may be an exporter of high-grade tungsten instead of an importer.

Prospecting for tungsten is not a bad business. Last year a small prospector stumbled upon deposits of tungsten ore in Wyoming that had been considered of no commercial value by scores of miners in the past; a company was organized, and today it has an efficient little plant, paying far better dividends than many of the mines of more precious metals within a radius of 500 miles. In this case the concentrate obtained proved remarkably free from phosphorus and sulphur, two of the most objectionable impurities, and hence the profits on the investment.

The manufacture of molybdenum has also increased rapidly with the greater use of this metal in steel-making. The molybdenum adds greatly to the malleability of steel. Along with tungsten this metal is becoming an important factor in manufacturing, especially for the best tool and armor steel. The molybdenum is obtained from molybdenite, a bluish-gray mineral, which greatly resembles graphite in appearance. The value of the ore depends upon the amount of molybdic acid it contains; this varies from 90 to 98%. When containing the high percentage the ore may bring $400 per long ton.

In this country the best deposits of molybdenite are found in Maine and Washington. Canada produces a fair amount, and deposits have been found in British Columbia. Small deposits are also reported in Arizona and New Mexico. So far the supply has not been excessive and all that has been mined has been consumed in our domestic steel-making. In addition to this, we are steady importers of the metal from Canada and Norway, paying 20% duty on it. The more recent use of molybdic acid in the manufacture of high-grade smokeless powder has increased the demand.

The employment of vanadium to increase the tensile strength of steel and its elastic limit has greatly increased the demand for vanadinite ore, from which vanadium comes. Vanadium, like uranium, was not supposed to be obtained in paying quantities in this country until lately. Deposits of the ore were found in South America and other parts of the world, but little systematic search was made in the United States. But today the vanadium obtained from the carnotite ore mined in Colorado has proved so satisfactory that much of it is exported to France for steel-manufacturing. The French have been the most progressive in utilizing the ferro-alloys for hardening, toughening, and otherwise improving their steel, and the fact that the American vanadium is considered best by them is good evidence of the value of the deposits in the West. Vanadium-bearing mineral deposits are also found in Arizona and Utah. Some of the ores contain only 10% vanadic acid, and are worth only 40c. per lb., but others having from 25% upward sell as high as $2.75 per pound. The recovery of vanadium from the carnotite is not a costly process, and improvements on the method are simplifying and lessening the cost each year.

Uranium was once considered a show metal, or one to be used for laboratory practice, but now that the industry of developing the ferro-alloys for commercial purposes has reached a high stage, this metal also is increasing in value. It is employed in the preparation of black pigments and for imparting certain desirable qualities to steel. In the steel industry uranium is used chiefly in combination with other ferro-alloys, and the demand for it is steadily increasing. Uranium ore is found in Colorado, Utah, and California, but in comparatively small quantities. If the present demand for it continues, prospecting for it will become necessary or the supply will have to be imported. Ore containing 10% uranium oxide is considered of commercial value, and any showing a higher percentage commands much larger prices. Samples showing as high as 20% oxide have been obtained from Colorado. It is believed by the best mineralogists that there are rich deposits of uranium in the Rocky Mountain region and that they will be discovered within a few years. The lucky prospector may find by that time that such a mine is of more value to him than one of gold or silver. The metal is sufficiently rare in all parts of the world to make prospecting for it worth while.

Radium.

The discovery of the property of matter known as radio-activity is probably the most important achievement of physical science since Newton taught us to understand gravitation. It has advanced our knowledge of the physical constitution of the universe nearly as much as the work of Darwin advanced biological theories as to the origin of life. The twentieth century, indeed, promises to carry the story of evolution one stage farther back than did the nineteenth. Darwin has enabled us to see how the process of evolution, dimly guessed at by philosophers and poets for twenty centuries, may actually take place in that still mysterious entity which we call living matter; how the structureless cells of protoplasm, which were almost certainly the first representatives of life on the earth, have, through the lapse of uncounted and immemorial ages, given birth to man himself and all his high hopes and wonderful works. The chemists and physicists who have been working at radio-activity for the last twenty years have carried the process of evolution farther back, and applied it to inanimate matter. Till within the last generation the atom as defined by Dalton was the ultimate concept of the student of Nature. Every material substance was found to be composed of the so-called atoms of some sixty or seventy elementary bodies, which no method known in our laboratories or discovered in Nature could split up into simpler forms. These atoms were thought to be indivisible, permanent, with no visible beginning and no apparent end. But we are now in the full glamor of the discovery that these atoms themselves are but highly complicated arrangements of still smaller entities, the 'corpuscles' which Professor J. J. Thomson predicted many years ago from mathematical considerations, and which the recent researches into radio-activity have definitely established as existing uner the name of electrons. It is now believed that every atom is a system of these tiny electrons, which are in constant motion like that of the planets in our solar system, and owe their remarkable stability to that very motion. Some atoms, like that of hydrogen, consist only of a few hundreds of these electrons, while others, like that of radium itself, probably contain hundreds of thousands of them. These electrons are thought to be all precisely similar, and it is probable that they constitute that primitive *ur-stoff*, or primordial matter, which many speculators have held to be the foundation of the material universe. Further, it is practically certain that they are closely related to electricity, consisting either of particles of this primitive matter, each of which bears a unit charge of electricity, or perhaps solely of such electrical charges, without any material basis at all in the usual sense of the word. This far-reaching hypothesis promises to revolutionize our views of the ultimate constitution of the universe, and forms the most fascinating addition to physical or chemical theories which has been put forward within living memory.—*The Spectator.*

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

In an action of trespass for taking ore from the claim or vein of another it makes a difference whether the person taking such ore was an innocent or a willful trespasser. An innocent trespasser is liable under the law for the actual value of the ore taken, less the reasonable cost of extracting the ore, raising it to the surface, transporting it to the mill, and reducing or milling it. But he is not entitled to claim any mitigation of damages for money expended in the running of levels, sinking of shafts, or development work, except to the extent actually necessary to the extraction of the ore in controversy. Neither can an innocent trespasser charge for any extraordinary expenses to his plant, or any wages to any persons except those actually employed and engaged in extracting, transporting, and milling of the ore in question.

Montana Mining Co. *v.* St. Louis Mining, etc., Co., 147 Fed. 897.

In an action for trespass for taking ore out of a claim and vein of another where extra-lateral rights were involved the trial Court stated the rule in its instructions to the jury thus: "Where one has the apex of a vein within the surface boundaries of his mining claim, and is entitled to extra-lateral rights thereon, such vein belongs to such person, and the possession of such mining claim is possession of such vein in its downward course to its uttermost depths, and the entire vein is treated and considered under the law the same as though it, in its entirety, was wholly within the surface boundaries of said mining claim, and a trespass thereon by third person is treated and considered the same as though it was a trespass upon said claim within its surface boundaries."

Montana Mining Co. *v.* St. Louis Mining, etc., Co., 147 Fed. 897.

Whether the question was as to whether or not a trespass was innocent or willful, as controlling the amount of damages, a trial court gave the jury this rule: "In determining the question of good faith of defendant in extracting and removing the ore in question, you are entitled to consider all the facts and circumstances shown by the evidence. If you find that the defendant acted under an honest belief that it was the owner of the ore in the disputed ground, and had good, right and lawful authority to extract the same and that such belief was based upon such facts and circumstances as that you believe that an ordinary man, acting as you find the defendant acted, would have had the honest belief that he owned such ore and had a right to remove it, then the trespass was not willful."

Montana Mining Co. *v.* St. Louis Mining, etc., Co., 147 Fed. 897.

Where a statute required that the upper and lower landings at the top of a mining shaft should be so securely fenced as to prevent either man or materials from falling into the shaft; the statute also gave a right of action for any injury occasioned by willful failure to comply with such provision, and provided that the defense of contributory negligence or assumption of risk could not be pleaded. It was decided by the Court that the purpose of this statute was to guard against the accidental falling of man or materials into a mining shaft, and that it had no application to the case where a miner voluntarily put his head through a fence into a shaft and was struck and killed by a passing cage.

Springfield, etc., Mining Co. *v.* Gordon, 147 Fed. 690.

An action to recover a per cent of the proceeds of gold according to the terms of a lease, to obtain an injunction against the lessee, preventing him from removing any more gold from the mine, to obtain an accounting of the gold taken under the lease, and the appointment of a receiver to hold the property pending litigation, was held to be essentially an action in equity, and that an equitable defense could be pleaded.

Kuzek *v.* Magaha, 148 Fed. 618.

The Tempering of Drill-Bits.

*Even a well-formed bit will be unsatisfactory if badly tempered; there are several methods of hardening, the degree of hardness imparted to the cutting edge depending principally on the temperature of the steel at the moment it is quenched. There are several good reasons for hardening directly sharpening is finished, known as 'plunging off the anvil,' but the great objection to the plan is that no particular temperature can be assured at that moment. To secure uniformity, therefore, it is best to reheat the steel, but the heat should be short, the object being to provide a hard cutting edge with a tough backing. Even when care is taken, the length heated is generally in excess of that to be hardened, and if the bit is cooled, the last 1½ in. at least at the end will be found hard, and more or less brittle. This may, in a measure, be rectified by decreasing the degree of hardness, a process known as tempering. When the hardened bit is again heated, the hardness passes off, not all at once, but gradually, each successive stage of decreasing hardness being recognizable by the color on the surface of the steel. These colors show up vividly on high-grade steels, and faintly on poor qualities; in each case they are easier to discern if the surface of the metal is brightened. On being heated to 440° F. the bit, which was when dead hard of a grayish white color, begins to tinge with yellow, and the softening process should be stopped by quenching in cold water; the same color serves also for hammer heads. If the heating is continued to 470° F., the color will be full yellow, or straw color; at 490° F. an autumnal shade of yellow brown is seen; both these colors are suitable for metal turning tools. The full brown, or copper color, at 510 to 530° F., is used to taps, dies, and axes; the purple blue at 540° F. for chisels, cutlasses, and knives; at 600° F. is the full blue spring temperature for saws, and if heated beyond this point the effect of the original hardening is lost.

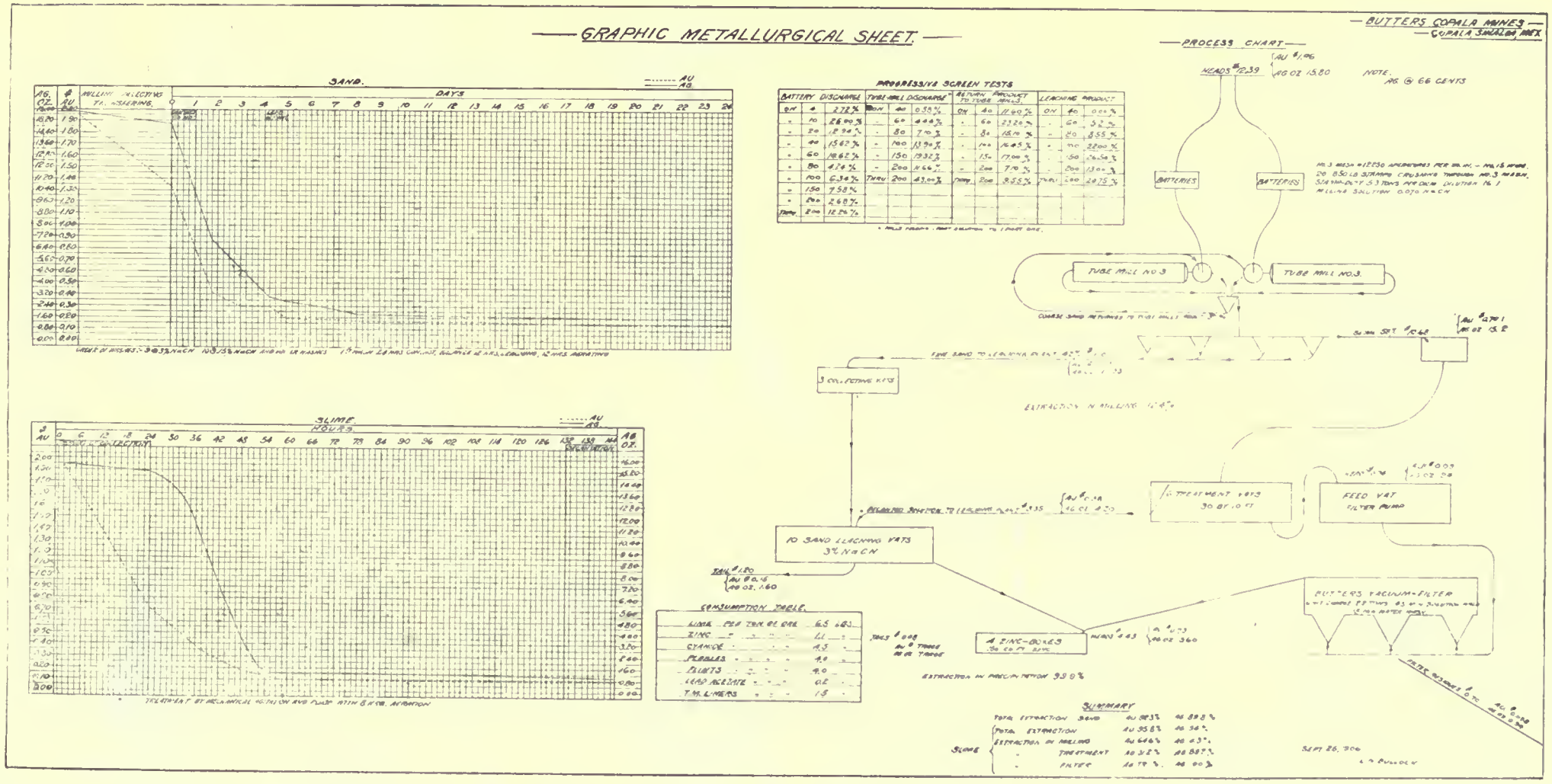
The temperature to which drill-bits should be let down is therefore 440° F.; a degree of heat which can be secured by placing the hardened bits in a molten mixture of one and three-quarter parts lead and one part tin. There is not the slightest doubt that an excellently hardened drill results from this system of tempering, but unless the above hardening bath is used, the time occupied is an objection. The smith has to watch the slowly heating bit for the required shade of color, and be ready to cool it when that shade is reached. To meet this objection, the following alternative plan is offered, the product is equally uniform, and the author has employed it with great success, having first noticed the idea in Colorado.

The hardening tank is provided with a diaphragm of coarse wire gauze, placed horizontally and supported at frequent intervals to keep it quite level; the cooling water enters near the bottom of the tank, and the overflow is fixed so that the water shall cover the screen to a depth of half an inch. Racks are placed above the tank to hold the drill shanks in a vertical position. The heated bit is simply placed in the tank where it rests on the wire gauze, only the last half inch of cutting face being below the water, and is maintained in an upright position by the rack. If a bar of steel one inch in diameter were treated in this manner, it would stand a chance of being ringed at the water-level; but owing to the thinness of the ribs this will not occur to the bit, provided it is not overheated. The thin tumbler stands boiling water, while the thick one cracks; the heated end of the bit is in contact with a comparatively small body of water, and the thin ribs conduct the heat and prevent any sudden contraction or 'ringing.'

*Abstracted from 'Gold Mining Machinery' by W. H. Tinney.

MINING AND SCIENTIFIC PRESS.

February 16, 1907.



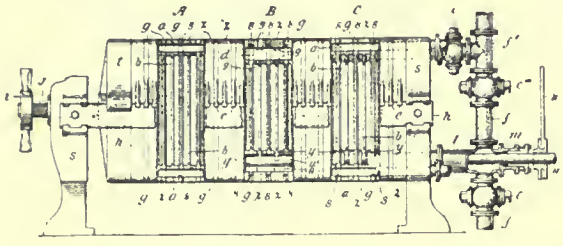
Metallurgical Chart of Operations in the Mill of the Butters Copala Mines in Sinaloa, Mexico.

This graphic presentation of the work done in a cyanide mill needs no explanation, at least, to those who are interested in the subject. The Butters filter is the main feature in the practice illustrated by this chart. By the use of it the same work is accomplished in five days as would be done by the decantation and wash system in two weeks. The ore is valuable for its silver, which occurs as a sulphide. We are informed by Mr. L. N. Bullock, who made the chart, that the use of lead acetate in the treatment of sand has proved efficacious; the tube-mill also has been most satisfactory for re-grinding, especially as the ore is unusually hard.

MINING AND METALLURGICAL PATENTS.

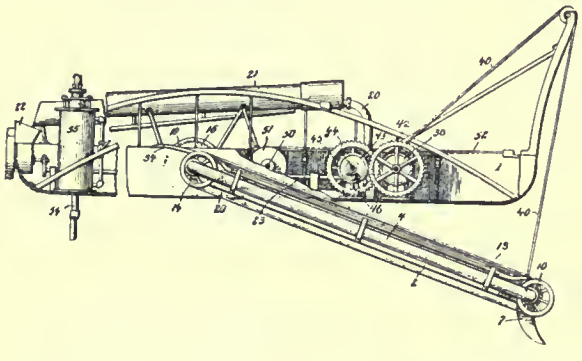
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PRESSURE-FILTER.—No. 842,484; Charles W. Merrill, Lead, South Dakota.



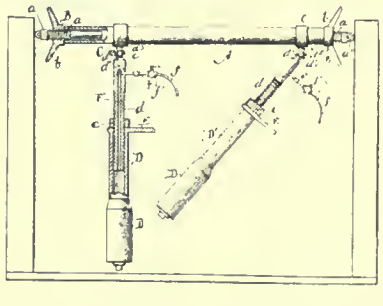
In a pressure-filter the combination with suitable filter-plates, of a container provided with a direct opening through which a cleansing medium may be introduced in any desired direction into the space within the container, and with a direct outlet through which the mixture of cleansing medium and unfilterable component is discharged.

GOLD-DREDGE.—No. 842,383; Horace J. Clark, Boise, Idaho, assignor to The Clark Dredging Company, Chicago, Ill., a Corporation of Nevada.



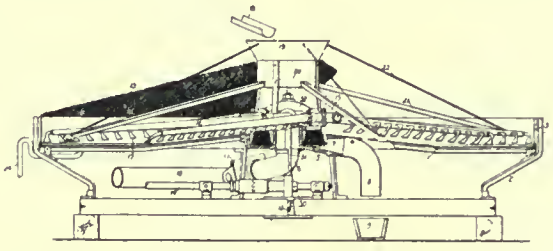
In a dredge, a suction-pipe formed in a plurality of sections, means for independently operating said sections, and scoops carried by said sections and provided with an inlet-opening for material thereto, and a priming-chamber disposed intermediate of said sections and connected with a source of supply.

MOUNTING FOR ROCK-DRILLS.—No. 842,654; Martin Hardsocg, Ottumwa, Iowa.



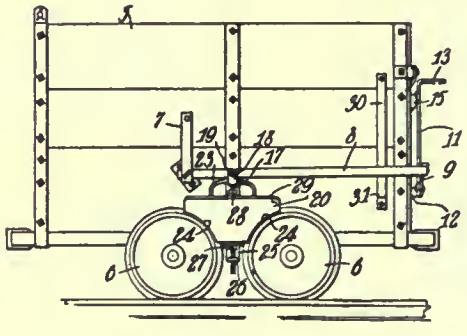
A mounting for rock-drills, consisting of a support adapted to be maintained in a suitable position with respect to a fixed abutment, a screw between the support and the abutment, a nut for regulating the pressure exerted by the screw against the support, in combination with a rock-drill having an extension or barrel rigidly secured thereto, a tubular screw-threaded shank adjustably secured to the support and entered into the extension or barrel and provided with a pressure-supply passage leading to its interior, a handle for forwardly projecting the barrel during the drilling operation, and a follower-nut on a screw-threaded shank for locking the barrel and drill in projected position, substantially as described.

AMALGAMATOR.—No. 841,990; Henry L. Lightner, San Francisco, Cal., assignor of one-third to William Priest and one-third to Henry Feige, San Francisco, California.



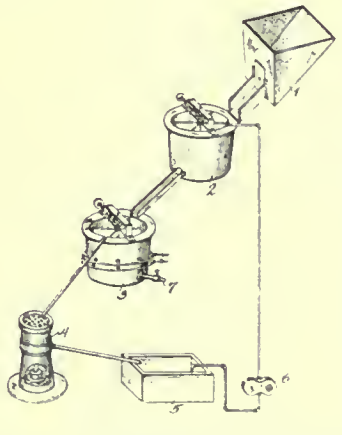
In an apparatus of the character described, the combination of an amalgamating-table having in the middle portion thereof a channel, and a chute leading therefrom, an air-chamber, hollow-arms extending from said air-chamber, nozzles connected with said arms and discharging downward and inward on said table, and means for feeding material to the periphery of the table, substantially as described.

MINE-CAR BRAKE-SHOE.—No. 841,264; Daniel S. Miller and John M. Landfair, Black Lick Station, Pennsylvania.



The combination with a vehicle, of a yoke pivotally mounted on the vehicle, a rod depending from the yoke, a brake-shoe adjustable vertically of the rod, a guide member passing through the rod and loosely mounted in the brake-shoe, and means for locking the brake-shoe in adjusted position. A vertically-adjustable brake-shoe pivotally mounted on the yoke and adapted to bear against the vehicle-wheels, a guiding member carried by the yoke and loosely mounted in the brake-shoe, and means for locking the brake-shoe in adjusted position.

PROCESS OF CONCENTRATING ORES.—No. 842,255; Alfred Schwartz, New York, N. Y., assignor to Schwartz Ore Treating Company, Phœnix, Ariz., a Corporation of Arizona.



The method of concentrating ores consisting in mixing with the pulverized ore rosin-oil, then separating said agent with its entrapped values from the tailings, and finally recovering the values from said agent.

A Platinum Coinage.

*The Russian Urals supply 95% of the world's platinum, and its production is in the hands of half a dozen concerns. It has been so for nearly a century. Without knowing even the meaning of the word 'trust,' these parties, by their very fewness, can always easily reach an 'understanding.' The Russian Government watches very closely the production of platinum—knows to a shave the annual production, and how the world is dependent on the Urals for its main supply—and is not slow to take advantage of this fact, and in turn have an 'understanding' with the few mine-owners. The increase in price in platinum is one of Russia's little helps to 'recuperate' after the late disastrous war. Japan did exactly the same thing with camphor. Knowing the world must have the Formosa article, the price has more than trebled during the past decade.

At one time, Russia had on hand such a stock of platinum that the question was what to do with it. It was a veritable 'drug on the market.' Finally, after years of 'chewing the cud' over the platinum glut, the Government hit upon the idea of using it as money. For seventeen years—from 1828 to 1845—the Petersburg national mint issued millions of francs' worth of money of fine platinum. The pieces were of three, six, and twelve roubles. Altogether the equivalent of a couple of million dollars' worth of platinum money was issued. Many specimens of these are still to be seen in collections at Petersburg.

Then the end came to platinum as a money-metal. To translate textually from a Russian source the motive for its discontinuance: "The essential quality of a monetary metal is its power to pass almost without expense from the form of the ingot to that of money, and *vice versa*. An ingot of gold duly refined can be moneyed, and the money thus obtained be re-cast in ingot, without the total expense of this double operation (coining and re-melting) exceeding one-half per cent of the value of the fine metal. For platinum—very difficult to work—the expense of the double operation would be relatively enormous."

What became of the platinum-money millions? Although officially withdrawn from circulation over half a century ago, it is estimated that less than a million dollars' worth has been received back into the national treasury, or otherwise heard of, during all the period elapsed. The other million or more is slummed away here and there among the stocking-hoardings of the Russian *mujiks*, in remote villages where little is heard of the outside world. These hoardings will go from father to son. If they find they cannot pass them at the nearest market towns, they simply take them back home, and throw them into the savings-pot or stocking. The average Russian peasant is so dense and so removed from any sources of information, that he will hoard paper roubles for years after they have been officially called in, and after notices thereof have been published in the official gazettes throughout the land. Of course he cannot read, and probably knows nobody who does, so he one day learns (years after the currency is obsolete) at the distant bazaar that his hoarding is valueless as Jeff Davis's scrip. Naturally discontent ensues, and the result is often one of those minor peasant insurrections incomprehensible to foreign nations.

However, in that hoarded platinum-money there is a million dollars' worth of platinum-fine assured 'in sight' to those who care to hunt for it. The question is how to find it. It would mean a journey of a couple of years from village to village—a knowledge of tact, and of the Russian language, so eminently requisite when inquiring into such a sensitive subject as a *mujik's* hoardings; yet the results, if successful, would be munificent. The unenlightened peasants would be glad to exchange their platinum pieces for modern coin, probably be pleased enough to get half their face value even.

*Abstract from article entitled 'Among the Platinum Deposits of the Ural Range,' by L. Lodian, in the *Electrical Review* of January 5.

Radio-Activity.

Though the researches of Professor Thomson date from 1881, the actual starting point of the branch of physics which concerns itself specially with radio-activity was the discovery of M. Becquerel in 1896 that certain compounds of the rare metal uranium were able to emit rays which would darken a photographic plate, in the entire absence of anything corresponding to ordinary light-rays. This led to the work of Madame Curie on the waste products of uranium ores, from which she finally succeeded in extracting some minute portions of a salt which was many thousand times more active than the original uranium salt. This is now believed to be a compound—usually the chloride or bromide—of a new element called radium. It proved to have a singularly important property, which has equipped investigators with a new method of research, surpassing in delicacy even that in which the spectroscope is used. The rays emitted by radio-active bodies ionise the air through which they pass, and thus make it a conductor of electricity. Consequently a charged electroscope loses its charge as soon as a minute portion of any radium salt is brought into its neighborhood. This test can be made amazingly delicate, and has enabled us to learn a wonderful deal about the properties of radium compounds, although the largest quantity of them with which any investigator has yet been able to work is less than a grain. Professor Rutherford has shown that a radium compound is continually emitting three kinds of rays that have a wonderful power of penetrating ordinary matter. One kind, known as the Alpha rays, consists of a stream of material particles which are on good grounds believed to be atoms of the rare gas helium, which the spectroscope long ago showed to exist in the sun's atmosphere, but which was only discovered on the earth by Ramsay in 1895. The Beta rays are also a stream of material particles, but far smaller than any known atom; they are probably detached electrons, or units of negative electricity. The Gamma rays are true ether waves, akin to the Röntgen rays. In the act of emitting these radiations the atom of radium is, of course, losing a portion of its matter. This is the kernel of the great discovery that a true atom is able to break up into smaller particles, and therefore that it must consist of some arrangement of such particles, which—and not the atoms—are the true unit of matter. In losing its electrons an atom is converted into an entirely different atom, which has quite different chemical and physical properties from those of the parent. Professor Rutherford has described these radio-active transformations. He is able to trace the successive degradation of the radium atom through at least six diverse stages, each produced by a loss of a definite number of electrons, until at length, as he believes, it ends as an atom of lead—one of the commonest and least active of metals. This is very different from the alchemist's dream of the transmutation of lead into gold, but it is at least as epoch-making a discovery. Only those who have studied the matter closely can appreciate the wonderful triumphs of manipulation and reasoning which have thus enabled our physicists to get inside the atom, and trace the motions of the infinitely small electrons which compose it. We are on the threshold of a complete revolution in our ideas as to the constitution of matter.—*The Spectator.*

Trade Conditions in the Transvaal.

Writing from Johannesburg, Special Agent Raymond F. Crist furnishes the following interesting report:

At Johannesburg, of course, gold mining is the backbone and mainstay of the population. The business of supplying the various equipments of the mines is influenced by the mining organizations or 'groups' to a large degree, and they throw the sales to their respective home manufacturers. Most of the mines are supported or dominated by English capital. Two groups are under German patronage, and invariably give preference to their people at home, while the sundry small and unattached mines and a few of the 'groups' are open, or partly open, to bidders from any country. Many of the American managers and superintendents of the mines have given place to Englishmen, so that the former no longer predominate. In fact, this condition is described as an American exodus, so rapidly are Americans leaving.

As the greatest influence toward promoting sales of our mining apparatus has been in these men, it can readily be seen that our goods will have to rely largely upon past reputation to bring future sales. That this will prove less and less effective may be deduced from a review of a few of the active influences operating to overcome the popularity enjoyed by American supplies and supplant it by an increased interest in British and Continental manufactures. Every sentiment of loyalty to Great Britain as the mother country is appealed to, and in addition the colonial governments set a pronounced example in support of these appeals, by awarding contracts of every nature — especially large ones — wherever by so doing it is not too offensive, to British manufacturers. In all municipal work the rule is to give the contracts to the mother country. An instance was cited to me where a difference of £12,000 in a contract had failed to throw it to American bidders, the contract going to England on a bid of £53,000 as against £41,000. In another case a smaller margin did not produce a different result. The difference was £300 only, but by specious statements these actions were justified. Both were on large municipal improvements, and in the first a policy of exploitation of South Africa for the benefit of England seems to be indicated.

In addition to the sentimental influence, there is another that is probably more far-reaching and effective. This is the system built up by English bankers, manufacturers, and exporters, and the South African importers and mine operators. The mines of South Africa are financed in great part by English manfacturers and bankers, the predominating number of shares being held by them. In addition, these people are also shareholders in the large export houses of England, which are financially affiliated with the importing houses of Johannesburg. With these influences at work it is evident that an easy commercial channel exists through which pass most of the goods for South Africa, as well as mining equipment. The same is true of all other goods, hence it explains the tremendous preponderance of British goods in this part of the world. The financial interests are thus enabled to collect dividends all along the line. From the sale of their manufactured products, commission on export, ditto on imports here, and dividends on mine earnings to interest on the money in the transactions passing through their banks, they net a pretty income on their various holdings. The same is true of German interests, with probably a more jealous guarding of their business.

This country holds out no Eldorado for American manufacturers at present. Business is moribund, save along the most conservative lines. Merchants confine themselves to the actual necessities. Stocks are being reduced and cut in every conceivable manner by the conservative and safe merchant. Others are going under, and have been for the past two years. Overstocking and an excessive number of merchants proportioned to the population have led to failures. Stock speculation on the part of everybody in 'wildcat' gold and diamond mines has taken away money for everything save the barest necessities, and in many instances reduced men to bankruptcy and poverty who two years ago counted their sterling in the many thousands. Scarcity of native labor and uncertainty of Chinese labor, together with the politics of the nonconformist conscience in England, have caused European capital to withhold support of investments partially developed. There are dozens of mines shut down, or working half-labor, which would undoubtedly yield good dividends if only supported with more capital. New mining equipment is not the order of the day; only supplies of parts, due to wear and tear, constitute the bulk of business on the Rand. Merchants of all classes are up in arms, and this means that a turn must come.

Publications Received.

ANNUAL REPORT of the Director of the Mint, for the year year ended June 30, 1906. Washington.

U. S. GEOLOGICAL SURVEY.—1. The Production of Gold and Silver in 1905. By Waldemar Lindgren and others. 2. Bulletin No. 306. Rate of Recession of Niagara Falls. By G. K. Gilbert. 3. Twenty-seventh Annual Report of the Director.

UNITED STATES GEOLOGICAL SURVEY. — 1. Twenty-seventh Annual Report of the Director. 2. Rate of Recession of Niagara Falls, by G. K. Gilbert. Bulletin No. 306. 3. The Cretaceous Flora of Southern New York and New England, by Arthur Hollick. Monograph L. 220 pages.

U. S. GEOLOGICAL SURVEY.—1. The Areas of the United States, the States, and the Territories. By Henry Gannett. Bulletin No. 302. 2. The Yukon-Tanana Region. By L. M. Pringle. This is a description of the Circle Quadrangle. Bulletin No. 295. 3. Geographic Dictionary of Alaska. By Marcus Baker. Bulletin No. 299. 4. Geology and Underground Waters of the Arkansas Valley in Eastern Colorado. By N. H. Darton. Professional paper No. 52. 5. Geology and Underground Water Resources of Northern Louisiana and Southern Arkansas. By A. C. Veatch. Professional paper No. 46.

Commercial Paragraphs.

The San Francisco offices of the GENERAL ELECTRIC Co. are permanently located in the Union Trust Bdg.

ARTHUR KOPPEL COMPANY, of 66 Broad St., New York, have established a branch in San Francisco and carry a stock of rails, steel ties, and industrial railway material in general.

THE HEWITT MACHINERY Co., of San Francisco, are agents for the Flint-Lomax Electric & Mfg. Co., of Denver, Colo. They manufacture a useful 65-lb. hammer for mine blacksmith work.

THE LINK-BELT COMPANY, of Philadelphia, Chicago, and Indianapolis, has opened a branch office at 321 Ellicott Square Bdg., at Buffalo, New York, and is in a position to give personal attention to customers of its drive-chain department in Buffalo and neighboring territory of New York, Pennsylvania, and Ohio. The facilities of the company in the manufacture of the Renold silent and other forms of power-transmission chains are tendered through its representative, H. C. Minier.

The Davis Calyx Diamondless Core Drill, manufactured by the INGERSOLL-RAND Co., 11 Broadway, New York, is a prospecting drill producing cores from 1⅝ to 15 in. diam. from any depth to 6,000 ft. It does not use diamonds, but, it is claimed, has never found a material which it could not cut at a paying rate. The cost of the entire apparatus is often less than that of the diamonds alone where they are employed, and the cost of diamond maintenance and replacement is entirely eliminated. It gives a double record, depositing the cuttings successively as they occur and removing the core in convenient lengths. For ordinary materials a rotating toothed steel cutter is used, this having a chattering action instead of a smooth cut, and for the harder materials chilled steel shot are used as an abrading material, the action of which nothing can resist. The apparatus is built in different sizes—the smallest operated by hand and the largest requiring 20 or more horse-power and capable of removing cores of large diameter from a great depth.

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Editorial.

AMERICAN mining men sojourning in London can get the MINING AND SCIENTIFIC PRESS from Leathwait & Simmons, 5 Birchin Lane, E. C. This firm also acts as our agent to receive subscriptions.

SVEN HEDIN, who has been exploring Thibet, has sent word that his expedition discovered many mountain ranges "and goldfields." This is important, if true.

IN THIS issue we publish an article of melancholy interest, for it is a posthumous contribution to metallurgy from T. S. Austin, who was one of the most successful smelter-managers in America and Mexico. To his brother, our friend the professor at the Michigan College of Mines, we owe this valuable transcript from experience. Others will apppear in succeeding issues of this paper.

THE VALUABLE article on mining practice by Mr. W. H. Storms, was prepared in reply to a direct request for information. Our page of 'Concentrates' represents the result of other intelligent questions. While the numerous queries that we receive entail a good deal of labor in their reply, and some of them may be useful only to the enquirer, yet, on the whole, we are glad to receive them, because they indicate what kind of information is in demand. As a rule, the answer to one man's inquiry is of direct benefit to several, and is of interest to many.

A STRAW shows the way the wind blows and many a sincere opinion is expressed in jest. It appears that someone on the Canadian Geological Survey has been guilty of some clever rhymes, to be found in the last issue of our friend *The Canadian Mining Review*, and among them we note the significant line

"C's the collapse when they cut the Keewatin."

Underneath this appears a mysterious intimation: "Nov. 4, 1906, Nipissing, $31.00; Nov. 4, 1908, Nipissing, $00.34." All of which suggests the prevailing opinion of the members of the Canadian Survey that when the veins of Cobalt penetrate through the Huronian into the Keewatin formation, things will happen.

ACCORDING to Cope Whitehouse, the Fayoum in Egypt (where an American scientific expedition is now sojourning) resembles the Salton Sink, in its origin, area, and depth. It was once a great backwater from the Nile; this was in 1700 B. C., and the conversion into fertile fields has given its 350,000 acres an official valuation of $400,000,000. Salton Sink owes its existence to the confluence of the Gila and Colorado rivers; the former strikes the latter at right angles, and by reason of a mutual check to their flow, the slackened currents deposited the sediment that has built a bank across the head of the

Gulf of California and diverted the waters of the Colorado. Should Salton Sink remain a large lake, it will improve the climate of that part of the country and induce fertility. Already it has increased the rainfall in the arid regions adjoining.

THEORIES CONCERNING secondary enrichment have been used cleverly by promoters to excuse poverty of ore and to fortify the promise of richness in depth. But it has remained for the 'fiscal agents' of a Nevada enterprise to explain a discrepancy in sampling by suggesting leaching action. Ore that assayed from $11 to $23 in August, 1905, was found in October, 1906, to yield only $1.20 to $3.60. No work had been done in the interval. In the prospectus the puzzling fact is referred to thus: "The difference in these assays from those of the year before, is accountable from the fact that the workings had been exposed to the weather, and values naturally had leached." This is an astonishing fact, if it be a fact—which it undoubtedly is not. The solubility of gold in surface waters is slight, and no such period of time as one year would accomplish anything. If it had, we should expect a rush of scientific men to the Lige Harris mine, at Bullfrog. No, it is not the marvelous operations of Nature, but the "ways that are dark" of men that will account for the anomaly. Either the samples were badly taken, or they were salted.

Telluride Ore in Nevada.

Although Tonopah and Goldfield are neighbors, as neighborhood is understood in a land of magnificent distances, and their ore occurrence is taken to be similar, it is a fact that there is a wide difference. Tonopah is primarily a silver camp, that is, the ratio of silver to gold is 100 to 1 in ounces, or 3 to 1 in value. At Goldfield the ore does not carry enough silver to part the gold; in the bonanza mineral the ratio is 8 to 1 in ounces, or 1 to 4 in value. In the lower grade stuff the small proportion of silver is even more pronounced.

Another matter of interest is the occurrence of tellurides. These occur in the bonanza ore of the Mohawk, for instance; the mineral is calaverite, the telluride of gold, which contains 44 per cent of the precious metal. It was first recognized as a mineral in Calaveras county, California, and since then it has been found as an ore at Kalgoorlie, Western Australia, and to a less extent at Cripple Creek, where sylvanite (a gold-silver telluride) is more common. In the rich mineral of the Combination mine, besides the native gold, there is gray copper in the form of an antimonial tetrahedrite, which has been mistaken for a telluride. It occurs in association with bornite. It is a notable fact that gold should exist as a telluride in three such phenomenally rich districts as Cripple Creek, Kalgoorlie, and Goldfield. The coincidence has gone far to remove the old prejudice against the association with telluride, which characterized several unsatisfactory ore deposits in Transylvania, Colorado, and New Zealand. Incidentally, referring to the simple test for a telluride by applying strong sulphuric acid to a bit of the suspected mineral, it is worth pointing out that this test should not be applied to a pulp sample, because the presence of iron (from pyrite) will obscure the ruby coloration. Try the experiment on a clean fragment of the mineral you think to be a telluride.

The Burlesque of Mining.

In the *New York Commercial* we read that Professor Samuel Aughey of the Smithsonian Institution, the United States Geological Survey, and the University of Nebraska, has just finished a tour in Nevada. In his report on the Lee district, Professor Aughey says that "most of the mines in this district show nothing on the surface. It is folly to expect to find values on the surface, and mining men need not expect to get them until depths of from 7 to 15 feet are reached." What a boon to the boosters! Now they can point to poverty at surface as proof of the real thing, the genuine Aughey grandmother lode! We expect to see this dictum of the professor quoted by every itinerant promoter, the qualifying sentence at the end being, of course, omitted. But, speaking seriously, we venture to advise the Smithsonian and the Survey to warn the members of their staff from making reports on mines and furnishing ammunition to pirates. Not many men devoted to purely academic pursuits are capable of judging a mine or sampling an orebody; in nine cases out of ten they make fools of themselves and stultify science. However, this episode of the professor is not the worst. We read in the *Daily Mining Record* that "the government has put the seal of approval upon the camp of Wellington, Nevada;" for has it not "issued an official pamphlet under the direction of the United States Geological Survey," in which "splendid mention is made of the district that was established by the Wellington Association," the last mentioned being an advertiser of shares that "will positively advance to 25 cents on February 15th." The report of the Survey only states that "connecting the larger veins are numerous quartz stringers, which course in all directions, *like promoters*, often containing crushed areas, *like deluded stockholders*." The words in italics are ours. But even this circus performance is not as bad as the "delirious trimmings" of certain pseudo-experts. One of them writes in the *Anaconda Standard*, the editor of which ought to know better, that at Greenwater "the lava flow becomes less and less apparent as we travel westward, and the eroded strata and geyser depositions of conglomerate (contain) hydrostatic andesite copper. Along the line of the ascending and descending waters is found an altered intrusive diorite. Iron in various forms seems to be so heavily associated with the altered diorite that a concensus of opinion considers (it) the original magma of the ore." It reads like geology, and yet it sounds like gibberish; it is inebriated balderdash. And stuff like this is published in the *Anaconda Standard*, the *Daily Mining Record*, and other papers that are supposed to illuminate those engaged in mining.

Next, we come to the opinion of the Colonel. We need not mention the name. "It is pay-ore from the grass roots," stated the Colonel (so says the Spokane *Chronicle*), "and we have literally mountains of it, vast in extent and some of it very rich. Our engineers tell us that we

have at least 50,000,000 tons of gold-bearing ore in sight. This wonderful property is on the South Yuba river in California. John Hays Hammond, the noted engineer and expert mineralogist, has acquired property below us which we believe inferior to ours, and yet Hammond recently declared that he has billions on his property. If he has one billion we surely have five billions." We doubt if Mr. Hammond would own to being an expert mineralogist, and we feel quite safe in denying on his behalf that he has a mine on the Yuba that contains billions. If he had, he would naturally make a present of it to the Guggenheims. Joking aside, the above is the sort of stuff that is published in a reputable journal, and is re-printed in a number of newspapers, even in the mining regions.

However, bad as the foregoing types of spoofery are, the most insiduous and the most injurious to legitimate mining, as it is to honest engineering, is the pseudomorph of science. Here, according to a Butte paper and the *New York Commercial*, is the report of Dr. Frederick Bass, one of the most eminent, etc., etc. From his doctorate we infer that he is also an officer of the U. S. Geological Survey, for that title is one of the distinctions (so we have been told) that the Survey confers on its employees. Speaking of Greenwater, where copper ore occurs in a sheeted rhyolite, Dr. Bass says that the submergence of the region (we quote verbatim, errors included), "with its secondary depositions, interrupted by volcanic eruptions and mass elevations, has been alternating up to a comparative recent time (probably miocene), as evidenced both by horizontal beds and tilted strata of calmanite or biborate of sodium found in various parts of the district, principally on the flanks of the shales, slates, and limestones — which, in places, also show distinctively the intercollations of volcanic rock (lava), thereby proving the successive alternating periods of submergence, upheavals, and volcanism." It is not nonsense, and yet it is not sense; it is geology drunk with mining speculation, and no longer able to do duty as science. It is the sort of jargon that is believed of those who sell shares for 10 cents that will rise to 25 cents before Friday next.

Finally, we quote from the voluminous literature that is sent out nowadays from the bucket shop, usually styled 'trust company' or 'bankers and brokers.' In referring to Mr. Lawson's recent vagaries in connection with Trinity stock, a circular (sent to us in the belief that we were among the great gullible), states: "The sympathy of many mining men, naturally enough, is with Mr. Lawson; for, as already pointed out, while they are not a unit that Trinity is intrinsically worth $65 and more per share, as Mr. Lawson loudly proclaims, they are still convinced that, so long as the public is enabled to get into a mining proposition at 10 and under and to dispose of it at 65 and higher, a general buying sentiment in mining shares will be created among thousands who have heretofore devoted their investment funds to ordinary investment issues. And in that way the mining interests of the country must benefit." The public is to buy at 10 and to sell at 65 — to whom? Will the brokers, who know that the stock is not "intrinsically worth" the higher figure, buy it? And if you buy at 40 and sell the stock for more than it is worth to someone even more 'easy', will not the difference between the real worth and the paper value of the stock represent a dead loss to him? And is it thus that "the mining interests of the country" are to be benefited? What rubbish! It is the semi-criminal class, the camp-followers of a beneficent industry, that will gain at the expense of the unwary. Poor geology, poor old mining, what things are done in your name!

The Deepest Gold Mining.

The distinction of the deepest gold mining still belongs to Bendigo, and it is pleasant to note that the past year was a prosperous one at that famous Australian mining centre. Owing to the fact that a close record is kept of the dividends and calls, it is possible to gauge the aggregate profit made by all the mines of the district. On an output of 225,099 ounces, the dividends paid were £246,254, and the calls (or assessments) £221,262, indicating that the net profit for 1906 was £25,000. This may seem a small result, but the fact is there are not many mining districts that can show, year after year, a balance on the right side for the sum of their operations. In most cases the money taken out of one mine offsets that which is put into another during the same period and many prosperous mining camps, if the account could be made up accurately, would exhibit a deficit. During 1906 the calls levied at Bendigo were heavier than at any time for thirty years, this fact being due to the costliness of deep mining in the case of half a dozen companies. The largest dividends were paid by four mines on a subordinate 'line of reef', called the Pyke and Moon, that is to say, not on the anticlinal axes celebrated for deep shafts. The ore of these successful properties came from workings ranging in depth from 900 to 1,900 feet. The New Chum 'line of reef', the anticlinal axis on which the deepest mines are situated, furnished only two dividend-paying companies, the ore coming from between 2,200 and 2,900 feet. The deepest mines do not appear on the dividend list. The New Chum Railway is crosscutting at 4,284 feet to connect with a winze from the 3,856-foot level, some pay-ore having been found in an exploratory cross-cut from the winze. The Lazarus mine is 3,617 feet deep, and "well mineralized stone" has been cut at that depth. Victoria Quartz, at 4,151 feet, found the top of a saddle that yielded 12 dwt. per ton for a while, but proved disappointing afterward. Work is in progress on the 4,254-foot level. On the whole, the evidence obtained is confirmatory of the opinion we have expressed on another occasion, that deep mining at Bendigo has gone too far and that the sentiment for deep sinking is not justified by the commercial results. Even the deep mines that are on the dividend list one year will be found on the call list next year, so that the real unprofitableness of mining below 3,000 feet is obscured. The sensible operators are those who are exploring the shallower ground within the area that has been proved to contain valuable ore deposits. Ore at 1,000 feet is more likely to be profitable than at 4,000 feet.

Personal.

W. L. AUSTIN is at Butte.

ANDRÉ P. GRIFFITHS is in Korea.

OLOF WENSTROM is at Mexico City.

HENRY F. LEFÉVRE has gone to Peru.

F. C. CARPENTER will go to Bolivia shortly.

FRANK ELMORE is expected in San Francisco.

J. H. CURLE has returned to London from Biarritz.

FRANK DRAKE visited San Francisco this week, from Bishop, California.

JAMES W. MALCOLMSON has his office now in the Bryant Bdg., at Kansas City.

CHARLES E. COXE is engineer to La Mona Mining Co., in Zacatecas, Mexico.

W. H. KNOWLES has opened an office at 644 Chamber of Commerce Bdg., Los Angeles.

A. D. BENTON is now manager for the Paymaster Con. Mines Co., at Tucson, Arizona.

ERNEST J. WELLSTED is now manager of the Kalgoorlie office of Bewick, Moreing & Co.

A. K. ADAMS has been appointed professor of geology in the New Mexico School of Mines.

H. W. BANGLE has resigned as superintendent of Los Grados mines, in Guerrero, Mexico.

W. H. EMMONS is engaged in geological work, for the U. S. Geological Survey, at Bullfrog, Nevada.

JOSEPH LUXON is the new superintendent of the Ivanpah Mammoth mines in San Bernardino county, California.

G. M. GOUYARD has been appointed consulting engineer to the Bonanza Belt Copper Co., of Johnstown, Arizona.

F. L. RANSOME, of the U. S. Geological Survey, has completed his geological investigations at Goldfield, Nevada.

H. C. HOOVER has gone on his periodical Australian tour, as representative of Bewick, Moreing & Co., London.

C. M. FUELLER, of Denver, has returned there from Marysvale, Utah, and is now at Toluca, Mexico, examining mines.

T. H. OXNAM has accepted the position of general manager for the Consolidated Arizona Smelting Co. at Humboldt.

J. E. MCALLISTER, smelter manager for the British Columbia Copper Co., is in Europe taking a well-earned holiday.

R. GILMAN BROWN, on becoming a resident of London, has ceased to represent Charleton, Dickinson & Co. at San Francisco.

ARTHUR L. WALKER has been elected a director of the American Smelters Securities Co., and a member of the executive council.

EDMUND B. KIRBY has been appointed manager for the Federal Lead Co., at Flat River, Mo., to succeed THOS. F. E. FITZGERALD, resigned.

W. A. HEYWOOD has accepted a position as smelter superintendent with the Spassky Copper Mines Co. in Siberia. He is now on his way to London.

EDWARD S. WIARD, of Wiard & Brown, Denver, has gone to Mexico on professional business connected with the American Smelters Securities Company.

FRANK H. PROBERT has gone to Corbin, Montana, as consulting engineer to the Boston Corbin Mining Company. In March he will go to Jalisco, Mexico.

H. VINCENT WALLACE, who recently returned from London to Nogales, is now on his way to Guanajuato, Mexico. He will proceed shortly to Durango.

EDWARD A. NIS has completed his professional work at Greenwater, Cal., and is on his way to Honduras, to be mine superintendent for the New York & Honduras Rosario Mining Company.

AMONG the geologists who have left the U. S. Geological Survey, by reason of the inadequate pay, are J. E. SPURR, G. H. GARRY, and W. H. WEED. The two former are with the Guggenheims, while Mr. Weed is with the Lewisohns.

EDGAR A. COLLINS, who has been in charge of the Combination Mines Co.'s property at Goldfield, Nevada, since it was purchased in 1903, has handed in his resignation. This resignation will take effect on March 1, when the active control of the property is taken over by the Goldfield Consolidated Mines Co. Mr. Collins has accepted the superintendency of the Montana Tonopah Mining Co., at Tonopah, and will enter upon his new duties in March.

L. VOGELSTEIN & Co., New York, give the following figures of German consumption of foreign copper for the months January to December, inclusive, in 1906.

	Tons.	
Imports of copper in December	10,017	
Exports " " " "	1,702	
Consumption	8,315	
Imports of copper January to November	120,753	
" " " " " December	10,017	
		130,770
Exports of copper January to November	9,513	
" " " " " December	1,702	
		11,215
Consumption of copper January to December		119,555

Out of this quantity 8,027 tons were imported from the United States during November.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, February 21.

Brunswick	$0.55	Lightner	$0.70
Con. Virginia	1.03	Savage	0.90
Mexican	0.93	Sierra Nevada	0.71
Ophir	2.70	Yellow Jacket	1.08
Belmont	5.32	Montana	3.78
Jim Butler	1.09	Mohawk	17.00
Jumbo	4.20	Red Top	4.20
Jumping Jack	0.30	Sandstorm	0.73
Manhattan Con	0.83	Silver Pick	1.46
Midway	2.04	Tonopah Ex	4.60

METAL PRICES.

By wire from New York.

	Average prices for week ending February 14.	February 21.
Copper—Lake (cents per lb)	25 @25½	25 @25½
" Electrolytic "	24¾ @25	24¾ @25
" Casting "	24¼ @24½	24¼ @24¾
Lead "	6	6
Spelter "	6.75@ 6.80	6.75 @ 6.80
Silver (cents per oz.)	68¾	68¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	February 14. £ s. d.	February 21. £ s. d.
Camp Bird	1 7 9	1 7 6
El Oro	1 10 0	1 13 0
Esperanza	2 14 6	2 11 3
Dolores	1 12 6	1 11 3
Oroville Dredging	1 0 0	1 0 0
Stratton's Independence	0 3 0	0 3 3
Tomboy	2 1 3	2 1 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Feb. 14.	Feb. 14.
Bingham Central	1½	1¾
Boston Copper	30¼	30¼
Calumet & Arizona	192½	194
Cumberland Ely	11⅝	12⅛
Dolores	8¾	8½
El Rayo	5⅞	5¾
Guanajuato Con	4⅝	4⅝
Giroux Con	10⅜	10⅛
Greene Con	32	31⅜
Nevada Con	17¾	18⅛
Nipissing	13	13⅜
Tennessee Copper	49⅞	50¼
Tonopah Ex	5⅛	4½
Tonopah-Belmont	5¼	5¾
Tonopah	17½	16½
United Copper	73¾	72
Utah Copper	38⅜	38¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Mining Summary.

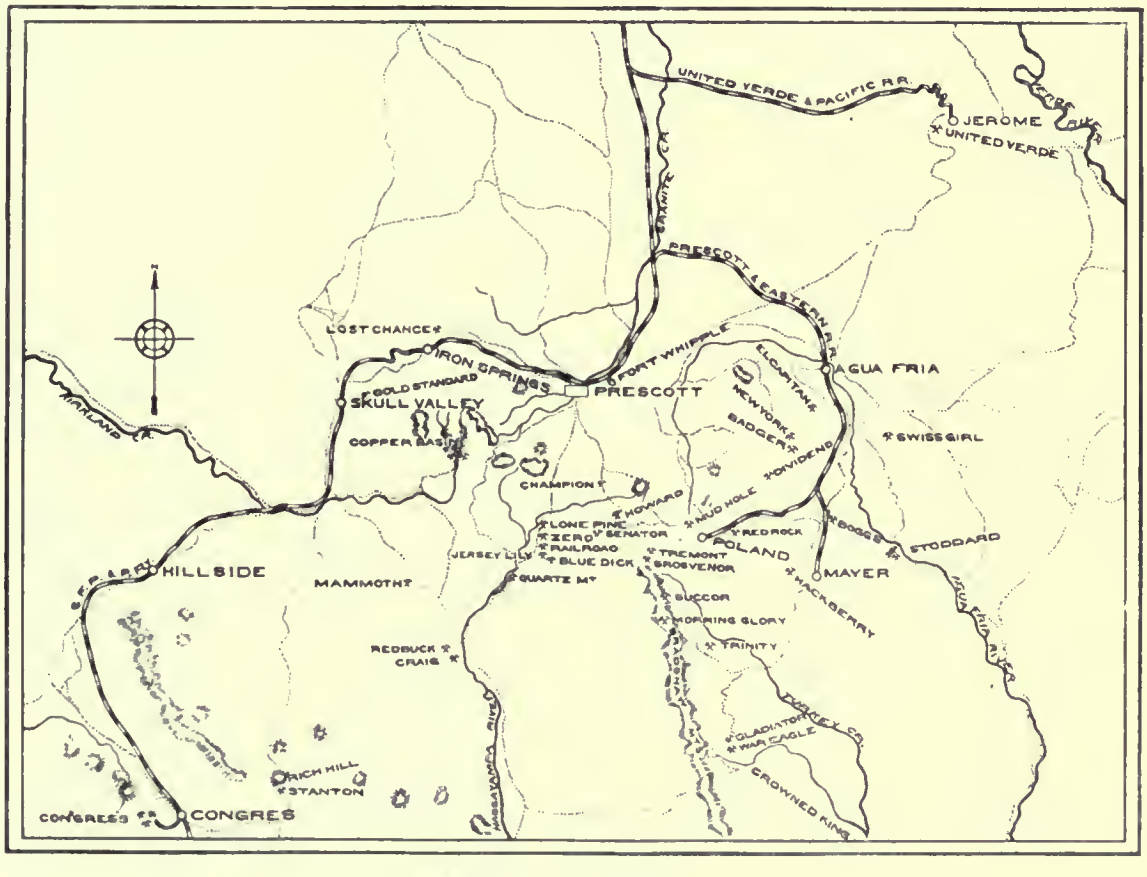
ALASKA.

Recent reports state that the diggings at the new Chandelar district are turning out to be rather disappointing. They are deeper than was first expected, and nothing of a sensational character has been struck as yet. Supplies are hard to get, and altogether it is not a desirable place to go, until more work has been done and more definite information is available.——The Latouche-Iron Mtn. copper mine, owned and operated by the Reynolds-Alaska company, at Horseshoe bay, is installing equipment that will enable it to produce 3,000 tons of ore per month. A townsite called Reynolds will be platted in the spring. Electric drills are employed at the property, power being derived from a water-fall 4,000 ft. from the mine. G. L. Banta is the superintendent.——A five-stamp mill will be erected at Nome, to be used as an experimental plant. A cyanide plant will be built in connection, and mill tests can be made in concentration also.——The Big Hurrah quartz mine at Solomon is employing about 40 men, and the mill is running continuously. A cross-cut is being driven on the 300-ft. level.——At Treadwell, the 240-mill and the Treadwell mine have started again. The Mexican and Ready Bullion started at the same time. During the shut-down, which lasted for nearly a month, many repairs have been made, and the plants are all in good shape. The fuel situation has been relieved by the arrival of a ship with 6,000 tons of coal; 120 stamps are to be added to the present 240-stamp mill at the Alaska-Mexican mine, and a new hoist will be installed at once. This addition will make 1,000 stamps in operation on Douglas Island, distributed through four mills, with a capacity of about 5,500 tons per day.——The Alaska Treasure company has completed its mill on Nevada creek, and will start operations about April 1.——In Silver Bow basin, about three miles east of Juneau, the Alaska-Perseverance company has nearly completed its 100-stamp mill, and underground work is progressing rapidly.

ARIZONA.

COCHISE COUNTY.

Over 700 miners have been laid off in Bisbee. The Spray and Czar shafts of the Copper Queen Co. are idle. The reason given to the men was that the shortage of fuel and lumber at this time makes it desirable to do repairing. It is reported as the general belief among the miners, however, that the situation is directly due to the attempt being made by the organizers of the Western Federation of Miners to make Bisbee a union camp. This organization has recently been perfected, and the local branch is known as Bisbee Local No. 160. The officers have declined to give the names of the leaders or the number of members. This action is causing a great deal of unfavorable comment, and local papers are pointing to the fact that there has never been any trouble in Bisbee, and that the miners there are receiving good wages, and have recently been given an increase by the operators. Many men are leaving the camp, and every train is crowded with men going to Cananea, Globe, and Tonopah. It is estimated that 375 men left in the two days succeeding the announcement of the lay-off. No further statement has been issued by the operators to account for the discharge of the men, and the situation is still a little puzzling.——Announcement has been made that the next regular dividend of the Calumet & Arizona will be paid March 20, at the rate of $5 per share. This is the biggest quarterly dividend ever paid by the company, and gives rise to the belief that the dividends will aggregate $20 per share in 1907. The capitalization of the company is 200,000 shares of a par value of $10 each, but shares sold as high as $195 on the Boston market last week. The mine is producing about 3,000,000 lb. of copper per month, and a sixth stack will soon be in operation at the smelter, which will increase the output materially. The company owns the Irish Mag, Buckeye, Senator, Gibraltar, Hope, and Wagner claims, the latter two having never been developed. A surplus of $5,000,000 is kept in the treasury.——Activity continues in the Paradise district. Over 500 ft. of work has been done on the Doran & Gallagher group.——The Bernoudy mine is looking well. Good ore has been cut in the east drift from the north cross-cut.



Map of a Part of Arizona.

MARICOPA COUNTY.

The litigation over the Fortuna mine, in the Cave Creek section, north of Phoenix, has been settled, and work will proceed under an entirely new management. Clarence E. Dresser will be the superintendent, and J. D. Thompson the manager for the company. The stockholders are New York and Pennsylvania people.

MOHAVE COUNTY.

The Golden Gem mill is running on dump ore and making a good grade of concentrate.—— Good ore is being mined by the Birmingham Leasing Co., on the Samoan property.—— Hoisting machinery has been ordered for the McKeeson mine, south of Kingman.——J. W. Thorn, of Philadelphia, has become interested in the Little Jack mine at Cerbat.—— Engineers have been examining the Maguire mine, three miles south of Kingman. The Bi-Metal claim of this property is a promising one.

PIMA COUNTY.

The Silver Bell camp is developing rapidly, and many properties are showing up well. The Paymaster camp is more active than ever before, and shipments of a carload of ore per day will soon be commenced.—— The Helvetia district has been entered by some of the larger copper companies, and it is rumored that the Helvetia Copper Co.'s property will be purchased by the Phelps-Dodge interests.—— Shipments are continued from the Twin Buttes property to the El Paso smelter. The company is planning the erection of a smelter at the property, and an extension of the railroad is talked of. This property has shipped 319 carloads of ore. New hoisting machinery has been installed and is working satisfactorily. Mr. Rose, formerly Mayor of Milwaukee, is heavily interested in the property.

CALIFORNIA.

AMADOR COUNTY.

The final decision of the Supreme Court of the United States has been handed down in the case of the Central and South Eureka mines. The Central Eureka, owned by the Coleman Bros., who used to operate the old Idaho mine in Grass Valley, gets the decision over the East Central Eureka mine. The point involved was: Has a mining claim, located prior to the act of 1872 and patented subsequent to that act, with convergent end lines, any extralateral rights. The Central's shaft, now down 2,400 ft., dips at 70°, and at a depth of about 1,500 ft., goes under the east side line of the claim. It was from below this point that over $1,000,000 was extracted. The end lines of the Central are not parallel, but converge toward one another, but the decision was given to this company, which settles a long and costly litigation.

ELDORADO COUNTY.

The Shaw mine has been transferred by Mrs. M. E. Morgan to the F. W. Barnard Co., of Beverly, Mass. This company also owns the Carson creek group, and the South Carolina mine at Angels. M. L. Green is the manager for this company. The property will be called the Morgan-Shaw mine, and is a large low-grade proposition, with a vein nearly 100 ft. wide. The new owners plan to erect a 20-stamp mill at once, which they will increase to 100 stamps, as development work progresses.

NEVADA COUNTY.

A good strike is reported on the Luzon gravel mine at American hill. This mine is on Fillmore ridge, between Wolf and Bear creeks. A rimrock tunnel has been run in for 250 ft., and a raise run 65 ft., which tapped the channel. Some new equipment will be ordered for the property at once.——Some rich gold quartz has been found in the Snow Point mine, belonging to Coppers & Hegarty, and situated in the vicinity of Moores flat. The ledge, which is about three feet wide, is worked through a tunnel.—Good progress is being made at the Gold Mound group of claims, on Deadman's flat. A gasoline hoist has been ordered.——The 10-stamp mill at the Conlin mine will be completed within a month. The mine has been forced to close down on account of the lack of fuel.——The Bear River Con. Tunnel Co. is making good headway in its tunnel on the north bank of the river. The ledge is growing wider, and the prospects are promising.

PLACER COUNTY.

The shaft of the old Iron mine is to be pumped out and sunk deeper. A new boiler and hoist are being put in place.——The last mill-run at the Bellevue mill averaged $40 per ton.——Twenty men are working at the Eclipse. The 10-stamp mill is running night and day. The owners are running the Cornucopia tunnel to tap the Enterprise, Friday, and Green mines at depth. An electric power line will probably be put in to run the Eclipse, and Gold Blossom mills.——Mining will soon begin in the Owl Creek district, between Spring Garden and Yankee Jims. The Rice location has recently been sold; it has a large vein carrying about $3 per ton. A mill was built on this property some 15 years ago, but as the capacity of the plant was small, and the ore uniformly low-grade, it was abandoned.

TRINITY COUNTY.

The French placer mines at Minersville have been bonded by G. H. Whitelaw, and work will soon commence. About 25 men are employed, and the property consists of 3,300 acres of promising ground.——The Bonanza King mine, near Trinity Center, continues to produce rich ore.

TUOLUMNE COUNTY.

(Special Correspondence).—The Rising Star group of mines, situated near Confidence, has been bonded to the Bagdad-Chase Gold Mining Co. The purchase price is $25,000, and is to be paid in two equal installments of $12,500 each, the first of which will be due in January, 1908, and the other one year later. Development work is to be commenced by March first.—— Shipments of ore from the Oak Hill mine, situated in the western part of the county, near La Grange, are being made regularly to the Mountain Copper Co.'s works at Vallejo. The ore carries 7% copper, $10 gold, and four ounces silver. The old shaft is being sunk to 300 ft. R. W. Alexander is superintendent.—— The Cocktail Gold Mining Co., composed of local people, has begun work at its gravel property, near Cocktail Hill, in the vicinity of Groveland. The prospects are said to be encouraging.—— An engine and compressor-building, and transformer-room are being erected at the Ida Klein mine, near Stent. When the machinery has been installed the prospect shaft, now 60 ft. deep, will be enlarged and used as the main working shaft. It is estimated that the dump contains 300 tons of $60 ore, besides which several tons of high-grade rock have been taken out in developmont work. —— Development work is in progress at the Mazeppa. A crew of 10 men is employed.—— At the Crystalline and Omega mines, of which C. W. Ayers is superintendent, 20 men are employed.—— Over 90 men are on the App mine payroll, and the 60-stamp mill is in operation day and night. Two valuable orebodies were recently uncovered, one on the 800 and the other on the 1,100-ft. level. W. A. Nevills, the owner, directs operations.——The Columbia mine, formerly known as the John Royal, has been sold to the Columbia M. & D. Co. for $18,000. The property is equipped with a Huntington mill and other machinery, and good orebodies have been developed.——The machinery for a 20-stamp mill has arrived at the Nonpareil mine and activity is predicted for the coming summer. A. P. Dron is superintendent.—— A rich copper discovery was made recently on government land near the Santa Ysabel mine. The vein is said to be eight feet wide. The property is to be known as the Green copper mine.—— The crew at the Longfellow has been increased, and the mill is in continuous operation.—— At the Mack mine there is much activity, and good ore is being milled.—— The Tuolumne Electric Co.'s power-plant, situated northeast of Groveland, on the Tuolumne river, is nearly completed, the only work unfinished being 8,000 ft. of flume, upon which progress is being made at the rate of 200 ft. per day. The company expects to have its plant in operation by April 15. The recent severe weather delayed the completion of the plant.

Tuolumne, Feb. 18.

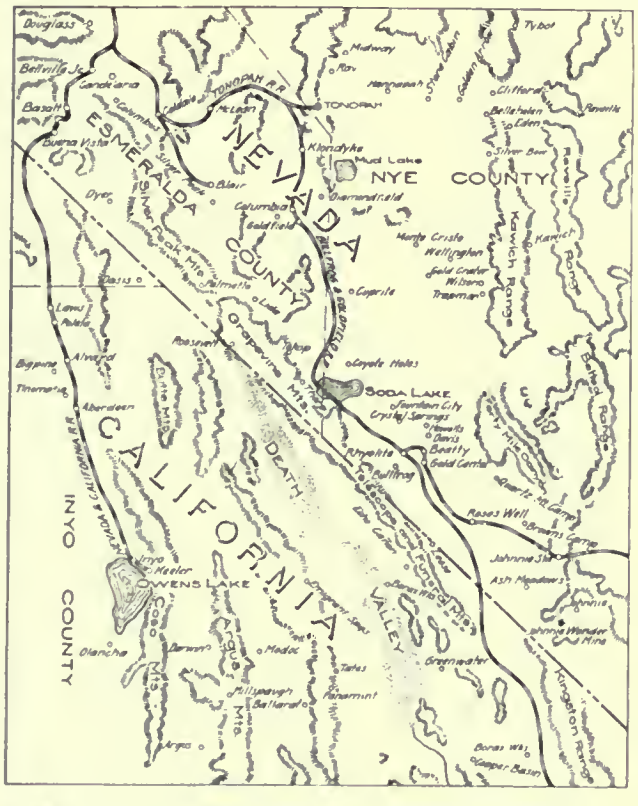
YUBA COUNTY.

French Corral, which was at one time a thriving hydraulic camp, is the scene of activity in quartz mining. A force of men has started work on the old Red Ledge copper mine which carries excellent values in copper, as well as gold

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Advices received from London during the past few days state that a syndicate of capitalists is negotiating the purchase of the Waldorf mine and the Argentine Central Railroad, the consideration to be $3,400,000. The Waldorf company owns 1,800 acres of ground, situated in east and west Argentine districts, in upper Clear Creek county. Past development has consisted in driving the Wilcox adit for a distance of 4,000 ft. While driving, a number of veins have been interseeted. The Tobin adit embraces 6,000 ft. of underground workings, and on the various levels a body of ore measuring from two to eight feet in width is showing. The mines have been equipped with machinery, including two concentrating mills, the combined capacity of which is 250 tons per day. Shipments have been maintained for many months past. Henry Lowe and Rees C. Vidler are promoting the deal.—— The organization of the Commonwealth Power & Electric Co. means direct competition and reduced rates for power



Map of the New Mining Districts of Nevada and California.

in the counties of Clear Creek, Gilpin, Lake, Summit, and Routt. Articles of incorporation were filed a few days ago with the Secretary of State, and the capital stock is $2,000,000 with shares of the par value of $100 each. Valuable water rights have been secured on the Grand river, better known as the Gore cañon, and work upon the dams has been started. When completed, storage reservoirs for the generation of 20,000-h.p. in summer, and 8,000-h.p. during the winter months will result. Many contracts have been signed with operators in the various counties and at a price never heard of before in the mountain districts. It is expected to have the plant in operation inside of two years. Sufficient funds have been pledged, and a number of St. Louis capitalists are interested in the proposition.——It is reported that the holdings of the United-Hydro Electric Co. will be turned over to the Central Power Co., the consideration being $1,000,000. The United-Hydro Co. controls all the valuable water-rights of the Georgetown district, the plant being capable of furnishing 4,000 h.p. Business is transacted in Clear Creek and Gilpin counties, and the institution is one of the best paying propositions of this district.——A pool of Idaho Springs business men has taken a lease on a block of ground in the Bellevue-Hudson mine, situated on Columbia Mtn. A winze is being put down to make connection from the upper workings with the sixth, or tunnel, level. The block of ground is 600 ft. in length. ——Work is to be resumed in the Burns-Moore adit about the first of March. The bore is in 3,000 ft. and is penetrating the richest portion of the Cascade district.——The Lamartine mine continues to ship high-grade silver-lead ores. Rohner & Co., operating a big block of ground, have a bonanza streak and the production during the present year will be heavy.——Four tons of ore were shipped last week from the Pike-Rowe lease on the Little Mattie, which averaged $500 per ton in gold and silver. A pool of Idaho Springs men is backing the enterprise.——The Smuggler, on Brown Mtn., continues to show rich streaks of ore carrying silver and lead. A recent shipment of first-class ran $125 silver per ton. The second-class is shipped to the mills at Idaho Springs, where it is concentrated four into one. The concentrate averages $50 per ton. C. I. Burt of Silver Plume is the manager of this property.——The Homestake Gold M. & M. Co. has been incorporated with a capital of $1,000,000. The holdings are situated on Lincoln Mtn., in the new gold belt of upper Clear Creek. An adit is being driven to interseet a group of six claims at good depth.—— G. J. Hite has secured a bond and lease on 1,000 ft. of the Glendower lode, on Columbia Mtn. The workings are being cleaned out and re-timbered, preparatory to running a cross-cut to catch the ore-shoot which was lost a number of years ago.

Georgetown, Feb. 18.

LAKE COUNTY.

A contract has been let to sink the shaft of the New Monarch, on the Cleveland workings, another 150 ft. The shaft is already down 500 ft., and new pumps will be placed to take care of the increased flow of water. The New Monarch property comprises about 100 acres on the northwest slope of Little Ellen hill, and in the neighborhood of the Resurrection, Diamond group, and the Fortune and Penfield, now leased by the Yak company. This mine came into existence about 10 years ago, but has shipped a great deal of ore since then. James McDonald is the manager.—— A good body of ore has been found in an old 500-ft. shaft of the Jaybird property at the head of California gulch. A lease has been let, and ore will be shipped at once to the Arkansas Valley plant.—— The Mt. Harvard tunnel, in the main range at Riverside, is shipping to the smelter in Leadville. —— Work is being pushed at the Corona lease ground, adjoining the A. Y. & Minnie. The Corona shaft is down 350 ft., and fully 800 ft. of drifts stand open.

SAN JUAN COUNTY.

The old Laekawanna, on Mt. Kendall, is producing again, and two cars of ore have been shipped during the last month by lessees to the Durango smelter.—— The Hercules company has let a contract for a 200-ft. double-compartment raise, in the Little Dora mine.—— The Champion, on Sultan mountain, is working a good force of men in the mine and smelter.——The Champion No. 2 property, owned by the Detroit & Colorado company, on Sultan mountain, is shipping three or four cars per week to the Durango smelter. L. L. Haines is the manager.

IDAHO.

(Special Correspondence).—Mining men all over the Northwest are commending the members of the Idaho legislature in taking action aimed at what are termed wild cat schemes. The full text of the measure after the enacting clause is as follows: Section 1. Any person who knowingly makes or publishes in any way whatever, or permits to be so made or published, any book, prospectus, notice, report, statement, exhibit or other publication of or concerning the affairs, financial condition or property of any corporation, co-partnership or individual which said book, prospectus, notice, report, statement, exhibit or other publication shall contain any statement which is false or wilfully exaggerated or which is intended to give or which shall have a tendency to give a less or greater apparent value to the shares, bonds or property of said corporation, joint stock association, co-partnership or individual, or any part of said shares, bonds or property, than said shares, bonds or property or any part thereof, shall really and in fact possess, shall be deemed guilty of a felony and upon conviction

thereof shall be imprisoned for not more than 10 years or fined not more than $10,000 or shall suffer both said fine and imprisonment.

Boise, Feb. 16.

IDAHO COUNTY.

(Special Correspondence).—J. S. Danforth has sold his group of claims near Dixie for $30,000. The purchasers are New York capitalists. A 10-stamp mill has been ordered and a sawmill will be taken in next spring. The claims are on Crooked creek. The group consists of seven placer and five quartz claims, on which considerable development work has been done.——Andrew Prader and Alexander Zimmerman, of Spokane, who have been doing assessment work on the Union group of claims, three miles from the American Eagle, near Elk City, report a strike of ore in the mine. Samples brought from the property show free gold. The ore was encountered 90 ft. in the drift from the lower tunnel.——J. A. Coverly, owner of the Snowstorm mine on Red river in the Elk City district, has made a strike of gold and copper ore. The extent of the orebody has not been determined.

Spokane, Feb. 16.

SHOSHONE COUNTY.

(Special Correspondence).—The Cœur d'Alene district will add several dividend payers to the list this year. The Monitor mine, a copper-gold property, has declared its first dividend of one cent per share and is getting the property in shape to increase its output.——The Stewart gives promise of being a producer before long.——The Tamarack & Chesapeake has completed its ore-bin and is in shape to ship silver-lead ore.——Oom Paul has a large amount of development work yet to be done, but the company is steadily pushing development. Aside from these properties there are a score of others which are expected to show up with development.——Ben E. Hervey, of Spokane, has bought from Louis Bouldoc and others the Wonder group of five claims in the Evolution district, three miles from Osburn, for $10,000 and an agreement to drive a 1,000-ft. tunnel. A contract has been let for 200 ft. of the tunnel. The claims will be deeded to the Big Twenty Mining Co., which owns a group of 15 claims near the Wonder group. The Wonder group has been developed with a 425-ft. cross-cut and drift, which have opened a vein from 10 to 15 ft. wide, carrying a streak of ore from 6 to 20 in. wide which runs 10% lead and 33 oz. silver. The tunnel will be continued 150 ft. to get under the big dike.——John Doekton and associates, who own the Pilot mine, near Murray, will start a new tunnel on the property from above the level of Golden creek, 600 ft. below the portal of the present lowest tunnel. The tunnel will be run about 1,200 ft. to get under the present showing. ——W. W. Jones, of Sandpoint, has taken an option on the Snowstorm claim on Garfield bay for Leadville parties. It calls for a payment of $5,000 in 60 days, $10,000 the second year, $15,000 the third year, and a flat royalty of 15% on all ore shipped. The option was given by E. E. Teape, G. H. Hipke, D. M. Garrison, and Antony Van Hemert, joint owners. The Snowstorm lies next to the American Eagle, which is owned by Jones & Taylor. The claim is patented and has been opened in three places with exeellent showing. ——Articles of incorporation have been filed for the Spokane & Montana M. & M. Co. It properties are near Iron Mountain, Mont., and consist of nine claims. The vein on the surface is four feet wide. The officers are: M. Luxenburger, president, and W. R. McCraeken, treasurer. Work is progressing on the property and will be pushed continuously. ——Two important strikes were made last week at Snowstorm hill, on the Æolian and the Copper Plate. The Æolian lies in Deadman gulch, south of the Lucky Calumet, and the Copper Plate is in a gulch tributary to Deadman, south of the National and the Independent.——Mark Davis and J. K. Riordan are in San Franeisco arranging for machinery for the Montana-Heela Mining company, owned by Spokane men. A compressor-plant, steam hoist, and pumps are to be installed and then milling will begin. There has already been a great deal of work done on the property. The main working shaft is down 215 ft. and about 800 ft. of driving has been done. The property is a silver proposition. It will be a steady shipper as soon as machinery is installed.——The Success mine in Nine Mile creek, near Wallace, has been a good producer during the last four months, and will soon pay a dividend. During the last four months 5,715,600 lb. of zinc ore and 1,143,000 lb. of lead were taken out. The zinc averaged 45% net, and the lead ore averaged 60%. The mill is the first in the district to handle zinc ore. The property was formerly known as the 'Old Granite,' and it was supposed to be worked out.—— The Evolution mine has been leased to D. H. Robinson for five years. The terms call for the steady employment of men and a payment to the company of 10% of the net returns on all ore shipped during the first three years, and 12½% on all ore shipped thereafter till the expiration of the lease.——The Heela Mining Co. has declared its 43rd divldend, this time $20,000, which makes a total of $1,020,000 paid by the company.——The Tiger mine, at Burke, has been forced to close, owing to the coal and fuel shortage. The mine is one of the allied companies of the Federal company, and it is reported that other mines are in a similar position. The temporary bridge at St. Regis is completed and it is expected that relief will come before any further action is forced on the companies.

Spokane, Feb. 16.

NEVADA.

LINCOLN COUNTY.

The Ohio Mining Co., operating south of Crescent, has one of the best prospects in the Crescent district. Good ore has been struck in the cross-cut tunnel at a distance of 90 ft. The vein disclosed in the tunnel is two feet in width. Samples assayed as high as $32.40 in gold, with small silver values.——The Pride of the West group has been purchased by the Nevada-Crescent Mines Co., of Denver. This group consists of the Pride of the West, Pioneer, Butterknife, Edith, Nettie M., and the Legal Tender lode mining claims, situated three miles north of Crescent. Mr. Stanich, the manager, has been developing this property for the past year and has opened up some ore on the vein traversing the Pride of the West claim. Samples from the vein returned two ounces in gold and seven in silver. A 15-h.p. gasoline hoist has been ordered, to sink to water-level.——On the Quaker City group, F. G. Toberg has a force of men sinking a shaft and prospecting the surface. A good vein was encountered recently while doing the annual work, the ore being an iron-stained quartz, carrying free gold. There are five veins traversing this group.——C. N. White and associates are doing development work on the Comstock group of seven claims; Excelsior group adjoining the Double Standard of two claims; Florence group on Calico Hill of three claims; and the Creseent Giant group, south of Crescent. A vein of iron-stained quartz can be traced for 2,000 ft. on the Comstock group.——Systematic development work has been progressing on the Oro-Nevada under the supervision of Geo. H. Morrison. This property has opened up three feet of ore, and a shaft is being sunk on the vein.

Crescent, Feb. 8.

NYE COUNTY.

(Special Correspondence).—The directors of the Manhattan Consolidated Mining Co. are considering the construction of a mill. A proposition to put in a pipe-line from Jett cañon, nine miles distant has been before the public for several months and some work has been done. Measurements at the Consolidated property show that the mine is making about 9,000 gal. of water per day and this would supply a 10-stamp mill. Underground work has been confined to the 200-ft. level but as timber and other supplies come, sinking will be continued.——Shares from the treasury stock in the various companies subsidiary to the Dexter will soon be offered to the public. This company has worked principally on the Union No. 9 claim, where three leasing-shafts are down 160 ft., to water-level.——A recent decision clears the title to the Earl claim on Litigation hill, and the Manhattan Earl Co. has been incorporated.——The Manhattan Mayflower Co. has prospected its ground by several 50-ft. shafts and now proposes to sink a vertical shaft 300 ft. deep.——The Verdi reports finding sulphides on the 180-ft. level. Superior camp continues to attract local attention.

Manhattan, Feb. 13.

BRITISH COLUMBIA.

The fuel situation has continued to handicap all the boundary producers during the first half of the month, and the smelters are still running on reduced capacity, and mine and smelter men are losing a good many shifts. For the week ending Feb. 2, the Centre Star shipped 1,290 tons; Le Roi, 3,750: Le Roi No. 2, 360, and crushed none. At the Centre Star, the main shaft is rapidly approaching the 14 level, while the development on the Idaho continues, especially on the seventh and eighth levels. The dike has been crossed on the fourth level. Development in the War Eagle is in progress on the third, fifth, sixth, and eleventh levels. In the Iron Mask, ore is being taken from the fourth level. ——The decision of the Supreme Court has been handed down in connection with the appealed case of the Consolidated Mines Co., and Le Roi, which were convicted and fined about a year ago for allowing hoisting engineers to work more than eight hours in the 24, which was a violation of the Metalliferous Mines Inspection act of 1901. The superior court sustained the decision of the lower court, and the fines will have to be paid by the companies.——The Consolidated M. & S. Co., has declared a dividend of two and one-half per cent, making a total of 10% for 1906. This is a good record, in view of the fact that the Trail plant was unable to handle the full production. The company is in a very prosperous condition at this time, and a good record of production is expected for this year.——At a meeting of the Le Roi stockholders held in London on Feb. 4, a dividend of one shilling per share was declared, making a total of six shillings for 1906. A good surplus was held in the treasury. The profits of the year were $232,200, although $16,000 was spent in developing the Vancouver mine in the Slocan district. Owing to the increase in the output, the cost of mining has been reduced to $3.85 per dry ton, as compared to $4.22 and $4.45 for the two preceding years. The company has also acquired an interest in a copper property in Queensland. The directors passed resolutions of praise for the management.——The Granby has decided to install a system of trolley-haulage on the 400 level, doing away with the horses. The system will be similar to that in use in the No. 3 tunnel, except that the locomotives will be smaller. Diamond-drilling will be started in the Greyhound mine, at Deadwood camp, which is under bond to the Rathmullen Mines Co. A boiler and pump have been installed, and the shaft is being unwatered.——A station is being cut at the 220-ft. level of the Crescent mine, and the shaft will be continued for another 100 ft. After the new air-compressor is erected, shipments of ore will commence.——The Brooklyn mine of the Dominion Copper Co. has been forced to close down again on account of lack of coal. The property will not be started again until a steady supply of fuel is assured. ——The International Coal & Coke Co., of Coleman, Alberta, paid its first dividend a short time ago. It amounted to one per cent on the par value of the shares, the amount distributed being $28,000.——The Bay mine will ship a carload of ore soon, which is said to average about $1,000 per ton.

MEXICO.

CHIHUAHUA.

It is believed that the A. S. & R. Co. will blow in its new smelter in Chihuahua not later than October. The capacity of the plant will be 800 tons per 24 hours.——It is reported that L. Vogelstein & Co. of New York are considering the erection of a smelter at Jiminez, taking over the concession granted to J. F. Johnston of Parral.——The Parral Power & Reduction Co. now has its first unit of 1,500 h.p. ready for operation, with transmission lines into the mines at Minas Nuevas and the mill of the Parral Milling Co.——The roadbed for the railroad from the Cigarrerro mine at Almoloya, to Baca station on the Parral branch of the Mexican Central railroad, has been completed, and track-laying will commence at once. A 25-ton Shay locomotive has been ordered. The Cigarrerro company has decided to run a 4,000-ft. tunnel into the mountain, from the south, this to be the main tunnel for both mines.——The Uruachic Mining & Smelting Co. of Glasgow, Scotland, is to construct a wood-burning reverberatory furnace in the Ocampo district. This will treat the ores of the company and also do some custom work. H. D. Boddington is the manager for the company.——Joaquin Chavez brought the result of the last clean-up at the Dolores mine to Chihuahua. This was the December output, namely, 40 bars valued at $42,000.——A recent shipment of eight carloads of ore from the Josefina group of claims at Sta. Eulalia, gave returns of 90 oz. silver per ton. The orebody was encountered at a depth of 104 ft.; S. G. Burn is the manager.——John R. Roslyn of New York has purchased the San Francisco mine, of 50 pertenencias, in the Aguazoquete district, and will start work at once. The ore carries silver, lead, and copper.——It is reported that the Mexican National Dynamite Co. is contemplating the erection of a second factory, of the same capacity as the one now operating at La Tinaja, Durango.——The Socorro mines, near Sahuayacro in the Ocampo district, have been taken over by the International Gold Mines Co., a corporation of St. Louis.——The Minas Tecolotes y Anexas at Santa Barbara are running one 250-ton unit of their new plant, and it is expected that the remainder of the plant will soon be completed.

GUANAJUATO.

William B. Smith and W. H. Osborne, of New York City, have organized the San Cayetano Tunnel Mines Co., to take over the San Cayetano group of properties in La Luz district of Guanajuato. These properties have been in the possession of the United Mexican Mines Association Ltd. of London since 1814 and have been among the largest producers of this celebrated silver camp. The tract consists of 750 acres, embracing 19 different mines. F. P. Rawle, and W. M. Wiley, of New York City, conducted the negotiations on behalf of the San Cayetano Tunnel Mines Co., the United Mexican Mines Association Ltd. being represented by L. Maurice Cockerell.——W. H. Osborne, L. M. Cockerell, and W. M. Wiley are leaving for Guanajuato to effect the transfer of the properties, after which active operations will be begun at once. It is understood that W. M. Wiley will temporarily assume the presidency of the company.

The Mexican Milling & Transportation Co. has been organized in Guanajuato to build and operate a belt-line railroad and engage in custom milling. The belt-line is designed to connect with the Mexican Central, and reach every mine and mill of importance in the district. The company has arranged to take over the mines and mill of the San Prospero company, which latter is now crushing and cyaniding about 130 tons per day; and also the 50-ton custom-mill of the Nayal Milling Co. In addition, the company will build a mill of 200-ton capacity at Santa Ana, and one of 100-ton capacity in the Santa Rosa camp, and increase the Nayal mill to 100 tons capacity. Thus the company will have a daily milling capacity of about 500 tons.

The annual meeting of the Mexican Mining Co. was held in Pittsburg on Jan. 18, and C. C. Auld was elected president. A favorable report was presented, and a mill is to be erected.

JALISCO.

A good body of ore running better than $2,000 per ton has been encountered in driving on the 280-ft. level of El Favor mine in the Hostotipaquillo district. This drift was driven east from the central winze, which is being converted into a working shaft. This property was purchased by Makeever Bros., of New York, in June, 1906.—— The old Mataraña mine, in the Mascota district, has been taken over by American interests, represented by E. J. Callahan. This mine was bonded some time ago to L. C. Malone of the Santa Lucia Mining Co., and his rights have been transferred to Mr. Callahan. This property is on Espiritu Santo mountain, about 60 miles west of Ameca. It was opened by a Spanish family named Medina, and is said to have produced $7,000,000 in gold and silver.

SONORA.

The Sonora Quartz Mines Development Co. is operating La Yaqui and El Tiro mines, at La Yaqui, in the Altar district of Sonora. G. W. Tantan is the superintendent.—— The Tecoripa Mining Co., recently organized in Texas, has taken over the Providencia group of mines at Tecoripa, in the Hermosillo district

Special Correspondence.

Salt Lake, Utah.

Shipments from Tintic.—The New Smelter.—Consolidation of Properties.—Improved Milling Plants.—A Strike at Alta.—Daly West Report.—Heinze Negotiating for the Silver King.

The ore and bullion settlements reported last week through Salt Lake banks amounted to $824,200. The ore shipments from the Tintic mining district last week amounted to 132 carloads, the shipping mines and respective amounts being: Ajax, 2; Beck Tunnel, 11; Bullion Beck, 5; Centennial Eureka, 49; Eagle & Blue Bell, 2; Eureka Hill, 3; Gemini, 5; Godiva, 1; Grand Central, 5; Laclede, 1; Mammoth, 13; May Day, 6; Ridge & Valley, 3; Scranton, 6; Swansea, 4; Tintic Iron, 5; Uncle Sam, 3; Victoria 3; Yankee Con., 4 carloads.

Negotiations are pending for a consolidation of the Star Consolidated and Black Jack, with a possibility of the Lower Mammoth going into the merger. All these mines are situated in the Tintic district. The Tintic Smelting Co. is preparing to let contracts for the equipment to be used in the lead smelter to be built near Eureka. Simultaneously with the beginning of this work the Eureka Railway Co., a subsidiary organization, will start grading on the railroad that is to connect the smelter with the principal mines of the district.——The new hoisting equipment recently purchased for the Lower Mammoth mine will be ready for operation before the close of the week, when ore shipments amounting to 100 tons per day will begin.

With the exception of a ratification by the shareholders of each company, a consolidation of the Bingham Central and Bingham Standard Copper mines at Bingham has been effected. Samuel Newhouse is president of both corporations.

Arrangements for a consolidation of the Copper Glance and Illinois mines are also practically concluded. They will form the basis of the organization of the Bingham Amalgamated Copper Co.——The Utah Apex Mining Co. is marketing about 100 tons of ore per day that brings from $18 to $20 per ton. The tramway recently installed has proved satisfactory.——The enlargement of the mill of the New England Gold & Copper Co. is progressing favorably. Recent developments in the mine are of a most encouraging character. Work is confined to the opening of the orebodies below the tunnel-level.——Some alterations are being made in the equipment of the Last Chance mine. Heretofore, it is said, the plant has not been making a good saving.——Ore transportation from the mines of Bingham continues unsatisfactory, officials of the Rio Grande Western still complaining of a lack of equipment to handle the traffic.

At Alta the Emma Copper Co. has cut the contact vein toward which the main tunnel has been driven, exposing carbonate ore to the width of 30 ft. A winze is being sunk and is expected to encounter the sulphide zone within 100 ft.——The Albion Mining Co. will soon build a mill. The mine owned by this company has been systematically developed and in the spring steady shipments of high-grade ore will be commenced. William Hatfield of Provo is manager.——The Continental Alta tramway is out of commission on account of being disabled by snowslides.

The annual meeting of the shareholders of the Daly-West Mining Co. resulted in the retention of the retiring officers; they are J. E. Bamberger, president; W. H. Dickson, vice-president; W. S. McCornick, treasurer; who, with F. J. Hagenbarth and Lazzard Kahn, the latter of Cincinnati, constitute the board of directors. The financial statement shows that on December 31 the company had on hand $411,886. There was received during 1906, $1,013,448 from the sale of concentrate and $9,928 from miscellaneous sources. The disbursements, including $432,000 paid out in dividends, amounted to $983,952. A total of 14,492 wet tons of first-class and 64,344 tons of second-class ore were produced. The company has paid all told $5,449,000 in dividends.——Negotiations are pending between F. Augustus Heinze and Keith & Kearns, who control the Silver King mine at Park City. It is believed here that the result will be the transfer of control. An examination of the Silver King was recently made by Mr. Heinze's engineers.

Cripple Creek, Colorado.

Strike in the Findley.—Pumping on Battle Mtn.—The Thompson is Leased.—Low-Grade Ore Treatment.—Fire at the Vindicator.

The rich vein of ore recently encountered on the tenth, or 875-ft. level of the Findley mine, on Bull hill, has been cut at greater depth on the eleventh level. Assays as high as $400 per ton have been obtained, and the ore when shipped is expected to give returns around two ounces per ton. On the tenth level the orebody has been proved up for a width of 20 ft., and it is an entirely new one in the history of the mine.—— Is is rumored that negotiations are pending for the united and systematic handling of the water situation in the mines located on Battle Mtn. The scheme consists of pumping at one of the deep shafts of that locality, either the Gold Coin or the Stratton's Independence No. 1. The latter being the deeper of the two is looked upon with the most favor. The cost would be distributed between the mines that would be benefited by this scheme, consisting of the Portland, Ajax, Strong, Independence, and Granite.

A lease has been granted on the Thompson mine of the Elkton Co. to the Western Investment Co. Machinery is being moved on to the ground, and air-drills will be put to work on the upper levels of the mine. The ore averages about an ounce in gold and should give fair profits at the present rates of freight and treatment. This property was formerly under lease to James Wright, who took out some fair-grade ore.

During the month of January 100 tons of dump ore were shipped to the Wishbone mill from the Mountain Beauty on Bull hill. Returns around $7 per ton were obtained by the lessees, Blanchard & Sellers. The milling company agreed to pay the lessees as their share of the profits, all over $5 per ton, they themselves trusting to the economy of their process to treat the stuff at a figure within the $5 margin.——Sinking has been resumed by the Mines Leasing Co. in the Johnson shaft on the north end of the Dante property on Bull hill. Work will be continued until the 500-ft. mark has been reached.

On January 14 the compressor and boiler-rooms and a part of the engine-room at the Hull City Placer mine of the Vindicator Consolidated Gold Mining Co. were destroyed by fire, the origin of which has not been determined. The men in the mine at the time were notified of the danger and were brought to the surface through Vindicator No. 1 shaft. Owing to the buildings being wooden structures the fire spread rapidly and was only with difficulty overcome. The output of the mine will be cut off until the buildings can be replaced.——Two cars of ore have been shipped this week from the Index mine on Gold hill. The ore was obtained at a depth of 365 ft. and gave returns around $40. Operations are also being carried on in a winze below the 700-ft. level, which is now down to a depth of 58 ft. The ore, running about an ounce and a half, is raised to the surface level by an electric hoist and trammed to the main shaft.

Toronto, Canada.

Shipments from Cobalt.—Taxation of Mines.—Bounties for Smelting.—News from Cobalt.—Several Rich Strikes.—Another Railroad.

Shipments of Cobalt ore for the week ended Feb. 9 amounted to 220 tons from the following mines: La Rose, 58 tons; Nipissing, 52; Kerr Lake (Jacobs), 36; O'Brien, 33; Coniagas, 22; Cobalt Central, 16 tons.

Frank Cochrane, the Minister of Lands, Forests & Mines, on February 13 introduced into the Provincial Legislature bills providing for the taxation of mines and mineral lands, and for the encouragement of the smelting and refining of ores in the Province. The first measure puts an acreage tax on all mining lands in unorganized territory, and a tax on the yearly profits of all working mines, whether in organized or unorganized territory. This tax will not apply in cases where the yearly profits are less than $10,000. The amount of the tax is not stated in the bill, as the details will be perfected later. The bill to encourage the refining of metals empowers the Government to pay bounties as follows: On refined nickel or the nickel content of nickel oxide, 6c. per lb., aggregate bounty per year not to exceed $60,000; on refined cobalt or cobalt content of cobalt oxide, 6c. per lb., aggregate bounty not to exceed $30,000; on refined copper or copper content of copper sulphate, 1½c. per lb. or on any copper product carrying at least 95% of metallic copper, ½c. per lb., aggregate bounty not to exceed $60,000; on white arsenic from mispickel ores, ½c. per lb., aggregate bounty not to exceed $15,000 per year. The bounties are to be payable for a period of five years, and if the sum appropriated is insufficient to satisfy all claims on the basis given, it is to be divided on a *pro rata* basis. The proposition to tax mines has aroused a good deal of opposition among mining men and should it be adopted, the impost will probably be a very modest one.

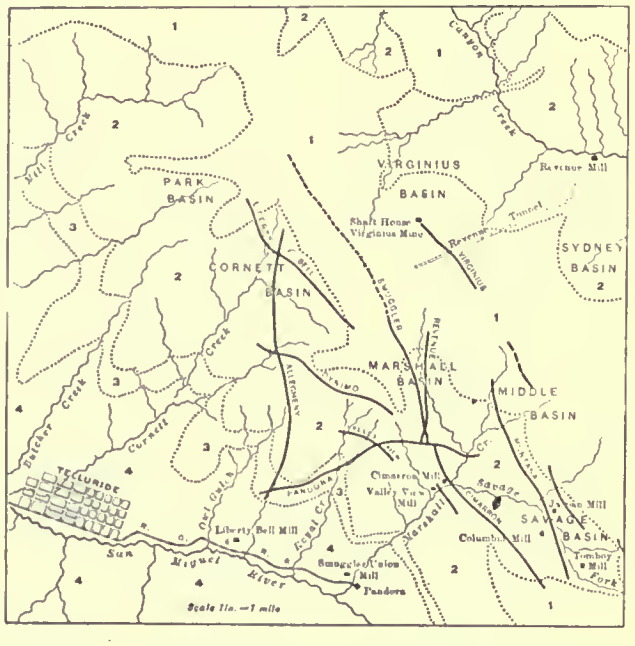
The Rochester Cobalt mine has purchased from the Rand-Jenekes Co. a plant comprising a 25-h.p. boiler, steam-drill, steam-hoist, and pump, which are being installed. Another rich vein has been discovered. Native silver was found in an open-cut on the main vein, which is about five inches wide and has been stripped for 250 ft. A shaft is down 18 ft., at which depth an assay was taken, showing 916 oz. silver per ton. Another rich vein has been uncovered some 50 ft. from the main vein running parallel to it, and about 2 ft. wide.——A strike of slab silver has been made at the 125-ft. level of the Nova Scotia mine. It is described as being richer than anything yet met with in the mine.——Silver ore with a showing of gold is reported as having been struck at the mine of the North Cobalt Silver Mining Co. at a depth of 40 ft.. This mine is two miles northwest of Cobalt, near the Green-Meehan.——Arrangements are being made for the sinking of an additional shaft on the property of the Lake George Co. to tap a vein containing native silver struck some time ago by diamond-drilling from a scow on the bed of Clear lake. The vein is thought to cross the Lake George location.——The work of lowering the level of Cobalt lake has been begun by the Cobalt Lake Mining Co. A dam has been thrown across and the water has been lowered several inches.——On one of the properties of the Cobalt Union Mines, Ltd., where systematic development is being carried on, a good vein of smaltite, rich in silver, has been discovered.

A charter has been received by American capitalists for the construction of a railroad up the Montreal river, to run through the Edison location and other properties, and probably as far as Evelyn lake, twenty miles up.—— The contract has been let for the construction of a branch of the Temiskaming & Northern Railway, running to Kerr lake, which will serve many of the leading mines. It will be about five miles in length.——Last week Dr. Hugo Von Hagen, president of the Hugo Von Hagen Exploration Co. of New York, J. T. Kirby, and Anthony Blum visited the Manitou Lake gold mining area, in which the company recently acquired large interests. They made an inspection of the Laurentian gold mine, and other properties, in order to make preliminary arrangements for development on an extensive scale.

Denver, Colorado.

The New Senator.—Treating Uranium Ore.—State Geologist.—Proposals for a State Survey.—Argument Against Appointing Professor, at State University.

The political turmoil incident to the electing of Mr. Simon Guggenheim as United States Senator has subsided, partly because of the tendency of the public mind to abandon a subject after having made it a nine days wonder, and partly because of Mr. Guggenheim's astute



Sketch Map of Telluride District, Colorado.

action in resigning his executive offices in the numerous large companies with which he is identified. Of course, this latter move is of no real significance, for Mr. Guggenheim still retains his interests in the companies, and by being relieved of any routine duties he is better enabled to aid them politically. But his action is well calculated to appeal to the unthinking, and thereby to restore the public confidence that was so badly shaken by the Senator-elect's inability to see why that eminently desirable virtue, gratitude, was not the only impelling force that induced the members of the Legislature to vote for his election after he had been so altruistic as to pay their election expenses. It is pleasing to observe, however, that class feeling has not entered into the consideration of the fitness of Mr. Guggenheim for his high position. Apparently he has not drawn the support of mining men because of his identification with mining interests, nor has the question of his race affected the opposition to him. This of itself is cheering, as another indication of the growing tendency in American public

life to consider public questions on their merits, without regard to prejudice, sectionalism, or race hatred.

It is interesting to note that the mill erected near the western border of San Miguel county to treat uranium ores is still in operation, after nearly a year of life. Such enterprises, being usually intended to exploit deposits that are problematical in their value and difficult to treat, making a produce that is fluctuating in its demand and value, rarely endure so long. It is now stated that a newly invented radium process is soon to be tried there. If it survives the strain of development it will have indeed demonstrated its strength and fitness to live. It is hard to refrain from expressing profound sympathy for any enterprise that is called upon to wrestle with a patented radium process.

The question of the State Geologist still continues to arouse discussion. Certain journals urge that the professor of geology at the State University should be the State Geologist, and that to take any other step is unwise. To lend force to their argument they point out that the department of geology at the University is, in its essential features, a place for geological research, and hence is perfectly adapted to conduct the study of the geological problems affecting the development of the mineral resources of the State. A moment's consideration suffices to exhibit the fallacy of such an argument. The nature of the department of geology at the State University is as stated, and because of this very fact it is to that degree unfitted for directing a State Geological Survey. Research in the way of pure science in the United States Geological Survey has always stood ready to do, and in fact has done all that has so far been accomplished. To attempt to duplicate on a smaller scale in connection with a State University and under the direction of a man whose abilities must necessarily be limited, work which in the hands of the Federal Survey can be carried out by the men who are the highest authorities in each particular branch of investigation, seems foolish enough. To the argument that the Federal Survey's work is so widespread that Colorado is hardly likely to receive as full attention as she deserves, are opposed the facts that in the past Colorado has received at least her full share of attention, and under the new organization of the Geological Survey is likely to receive even more in the future. In any case, the partial attention of the Federal Survey, with its larger resources and greater facilities for work, is likely to result in more accomplishment of real worth than the entire attention of a State survey, hampered by political affiliations.

The real need of the situation seems to be for a man of business ability, and with a competent knowledge of geology, mining, and metallurgy, who will be able to co-ordinate the work, organize the scattered forces, work in collaboration with the Government bureau in the larger phases of his work, and carry out himself such investigations as are of purely local interest, or of such special application, as not properly to come under the scope of the larger organization. Above all, he should be a man capable of considering the situation always from the standpoint of applied science.

Professors of geology are rarely noted for their business ability; and if they were in large degree capable of applying science to industry they would not be teaching geology. Therefore to make the professor at the State University also the State Geologist, rather than to choose for the position a man of business ability, broad general training and of experience in the practical application of geology to mining, is a move calculated to defeat the very end which it is sought to gain. But any organization is better than none at all, and if the elevating of the professor to the position of State Geologist is the only thing that can be done, by all means it should be done and so end the present chaotic situation.

Butte, Montana.

Operations in Full Swing.—Big Strike in the North Butte.—Also in the Anaconda at 2,400 Ft.— Minnie Healey Cuts Fine Orebody.— Butte & London.—North Butte Extension Co.— The Smelter Smoke Trouble.

All of the Butte producing mines are again running full blast, for the first time in two months, and the February output may slightly exceed that of January, when the copper production of the district was estimated at about 21,000,000 lb. Amalgamated officials say that the estimate was too high, as the Amalgamated mines were closed from one-third to one-half the time.

One of the biggest strikes ever made in this district is reported from the North Butte, which has cut a vein 28 ft. wide, fully half of which is copper glance, in the cross-cut driven from the 1,600-ft. level of the Jessie mine north to the Berlin claim. The clean ore assays 50% copper, and the strike is not only of material importance to the North Butte Co., but it is encouraging to a number of other new enterprises operating in that part of the district. The strike is farther north than any other copper vein yet developed to commercial importance. The company has given out no information regarding the strike, but it is understood to have been made in the Berlin claim itself. The cross-cut, which started at a depth of 1,600 ft., taps the vein at a depth of about 1,800 ft. in the Berlin. The Berlin vein, according to local opinion, runs in a slightly northeasterly direction and therefore will go through several of the claims of the North Butte Extension and the property of the Butte & London.

The East Butte has started three cross-cuts, one north from shaft No. 11 at the 400-ft. level to connect with a cross-cut started south from the 400 of the No. 1 shaft. It is expected that the connection will be made in about two months. Another cross-cut is being driven south from the 600 of No. 1 shaft and one north from that point. There are 21 known veins in the East Butte ground, all of which will be intersected by these cross-cuts between the two main shafts. There was some apprehension as to the quality of the ore that would be found at a depth of 600 ft., because there has been much talk about an imaginary iron cap that would be found at and above that point. The south cross-cut at the 600 has cut one vein about 80 ft. from the shaft and the vein was found wider than on the 400 and fully as rich. About four feet of it is first class ore, assaying 8% copper and better. The remainder of the 14-ft. vein is made up of concentrating ore.

The Anaconda Co. has cut the big Anaconda vein at a depth of 2,400 ft. in the Neversweat, the same depth at which it was cut about a year ago in the Anaconda mine. The orebody is of the same width, about 60 ft., and 40 ft. of it is nearly all copper glance, running 60% copper. Only two men are working on the ore and all that is taken out is sacked and sent to the smelter. With the big vein opened in both the Anaconda and Neversweat, there can be no doubt that it will also be found in the St. Lawrence mine of the Anaconda Co. and the Parrot mine of the Parrot Co.

The Coalition Co. has also cut into a splendid body of high-grade copper ore in the Minnie Healey mine, 100 ft. deeper than at any point at which the vein has yet been worked. While sinking a winze in the western portion of the mine to a depth of 1,300 ft. the orebody was encountered and some cross-cutting on it has been done. It has been sufficiently explored to give pretty good assurance that the ore is extensive. It is all first class,

assaying better than 8% copper. The Minnie Healey is developing into one of the best mines in the district.

Sinking has been resumed by the Butte & London Co., the pump having been installed at the 800-ft. station. The shaft will be continued until a depth of 1,500 ft. is reached, from which point cross-cuts will be run north and south.——The Butte-New York Co., which was organized by a few insiders of the Butte-Milwaukee Co. unknown to other stockholders, and which is directing the work on the Colonel Sellers and other properties of the old Butte-Milwaukee, is doing some rapid development work. A new hoisting engine has been placed on the Colonel Sellers, and a six-drill air-compressor is being installed. The shaft is now about 90 ft. deep. The Butte & Bacorn Co. has resumed sinking from the 500-ft. point of the Calumet shaft and it will be taken to a depth of 800 or 1,000 ft. before any more cross-cutting is done. In the 500 cross-cut two big veins were intersected, but at that depth they do not carry commercial ore.

The North Butte Extension Copper Mining Co., recently organized by G. A. Lauzier, of Butte, and financed by W. T. Van Brunt and associates, of New York, has three or four claims located on the extension of the Blackrock vein, which has been recognized by mining engineers as one of the big lodes of the Butte district. How-

Montana.

ever, the Blackrock has been opened only to 300 ft., to which depth it has yielded only silver ore. The Butte & Superior is engaged, however, in sinking the Blackrock shaft, and it is now nearly 600 ft. deep. At a depth of 800 ft. the vein will be explored. In the lower workings, on the 300-ft. level, some copper ore assaying as high as 3% was found while lessees were working the property before the organization of the Butte & Superior. The Blackrock vein has been traced across the Overman, Black Crow, Assay, and Occidental claims of the North Butte Extension Co. The latter will soon begin sinking a shaft on the Black Crow, for which active preliminary work has been going on during the past week. The North Butte Extension claims lie north and east of the Berlin group of the North Butte Co., from which fact it takes its name. The North Butte is sinking a shaft on the Berlin claim, and is also driving a long adit to that ground from the Jessie mine, situated some distance to the south. That part of the district is very active, and mining men look to the new companies to open some big mines there. Among those doing development and exploration work there are the Butte & Superior, Butte-Milwaukee, North Butte, Butte & London, the North Butte Extension companies, and W. A. Clark is sinking a shaft on one of his claims adjoining the Blackrock. The Lewisohns are also putting down a shaft on the Granite Mountain, near the North Butte mines.

It develops that six experts from the Agricultural Department at Washington have been detailed, by the direction of President Roosevelt, to assist the "smoke farmers" in the litigation against the Amalgamated, in which they are seeking several million dollars as damages and an injunction against the company to shut down the smelter The experts represent forestry, live stock, agriculture, etc. Some of them have already appeared in the trial of the case as witnesses for the farmers, and have admitted that they are participating in the litigation on orders from their superiors. It has developed that the President personally became interested after receiving a representative of the "smoke farmers," who bore a letter of introduction from a prominent Montana cattleman, a former acquaintance of Mr. Roosevelt on the plains, and that it was strongly represented to the President that the "farmers" were downtrodden victims of the Standard oil.

Calumet, Michigan.

Better Weather.— Ore Shipments Resumed.— More Purchases by Calumet & Hecla.— Work at the Nonesuch.

The storms which seriously interfered with railway service in the Lake Superior copper region during January and a few days in this month appear to be past, for the time being, at least, and the mines are again producing normally. During the recent storms snow covered railway tracks at some places to a depth of six feet, and shipments of rock to the stamp-mills was impossible. The companies owning and operating their own railroads fared better than those depending upon the larger roads. The Calumet & Hecla, and Quincy mining companies operate private railroads between their mines and stamp-mills. These lines were kept open during most of the bad weather, while mines depending upon the public roads were without facilities. The Allouez lost six days and the Centennial seven days in January.

Interests close to the Calumet & Hecla have purchased a tract of 228 acres of land bordering on Torch lake, and known as the Gregory property. It comprises three mill-sites formerly owned by the Centennial, Mayflower, and Old Colony companies. It is understood that the property has been acquired for La Salle company, a newly organized corporation, which is a consolidation of the Tecumseh, La Salle, Caldwell, and contiguous lands on the Kearsarge amygdaloid lode. La Salle company is controlled by the Calumet & Hecla, a majority of the stock outstanding in the former being in the treasury of the latter. Report is to the effect that La Salle company will erect a stamp-mill upon the site which has just changed hands. The property is opposite the mills of the Calumet & Hecla, on the other side of Torch lake, at Lake Linden, and is a most desirable one.

The Calumet & Hecla Mining Co. is continuing the exploration of the Nonesuch mine, in the Porcupine range of Ontonagon county, it having a three years' option upon the property. The Nonesuch has always been admitted to be a rich property, but the serious difficulty has been to save the copper. The metal is so finely dessimated throughout the sandstone-conglomerate lode traversing the property, and the copper of such a flaky nature, that it has been lost in the tailing. The Calumet & Hecla company recently completed the erection of a stamp-mill at the mine, and has been treating the ore for some time past. The result is understood to be satisfactory. Several barrels of the mineral have been shipped to the Calumet & Hecla smelters at Hubbell.

The Baltic lode is supposed to have been cut in the

drill-holes of the Lake Copper Co. in Ontonagon county, at a point 25 miles south of the Copper Range Con. mines. The cores show a lode 40 to 50 ft. wide, carrying a fair amount of copper. This discovery may prove important to the adjoining mines, namely, the Adventure, Mass, and Victoria.

Joplin, Missouri.

Output of Zinc and Lead Ore.—High Prices Are Maintained.—New Mills Started.—Several Strikes by Drilling.—New Prospecting Operations.—A Cave Leads to Discovery of Ore.

The highest price reported paid for zinc ore during the week ending February 2 was $52.50 per ton for one bin of ore from the Missouri Lead & Zinc Co's. land, and for the week ending February 9, $52 for one bin of ore from the Continental Zinc Co.'s land. The highest price paid for lead ore during the same period was $88.50 per ton for a few choice bins in both the Joplin and Webb City districts:

Shipments.	Zinc Ore Lb.	Lead Ore Lb.	Combined Value.
Week ending February 2	13,4 5,620	1,622,040	8376,820
" " " 9	12,003,510	1,532,740	347,917
Up to date	68,292,280	9,253,060	1,962,253
Same period last year	59,088,570	8,356,360	1,665,745
Increase	9,203,710	896,700	296,490

A party of stockholders of the Alice of Old Vincennes mine, situated at Chitwood, arrived in Joplin last Friday to witness the starting of the new 150-ton mill on their property. This was the first visit of some of the men to this region and they were surprised at the magnitude of the mining business. After seeing the mill started, they visited the underground workings of the mine and were pleased with the sight.——The frame-work of the new 250-ton mill on the Church & Mitchell property south of the Conner land at Prosperity is rapidly nearing completion. Prospecting on this property began a year ago but it was only recently that the shaft was sunk to a depth of 225 ft. and driving began, so as to open up some big orebodies, warranting the erection of the mill. There is a large pile of ore on top awaiting the completion of the mill. This promises to be one of the best producers in the district.

The Webb City Mining & Leasing Co., operating on the old Garrison land, is making extensive preparations for developing the property which was only recently acquired. They are enlarging the old mill from a 200-ton to a 250-ton plant. This is situated on the east portion of the lease. They have a new sludge-mill now in operation and are producing a quantity of ore from it. The erection of a 250-ton modern concentrating plant will be begun shortly on the west portion of the lease, where there is already a shaft down to the orebody. This property was at one time one of the big producers of the district, but the mining was done at a much more shallow depth than the present operations. J. F. Gallagher is manager.——The Seven-Up Mining Co., operating on the Missouri Zinc Fields lease at Webb City, has made a rich drill strike at a depth of 150 ft. A shaft will be sunk immediately.——H. W. Fullerton of Springfield, Ohio, and I. E. Raymond, of New York, who are associated with W. G. Koontz of Webb City, in a 20-acre lease on the Guinn land north of Webb City, have made a rich strike. The ore was found by drilling at a depth of 160 ft. and the cuttings show both lead and zinc ore.——At a depth of 205 ft. the orebody has been cut in the north shaft of the Trinity Lead & Zinc Co.'s property, near Duenweg. This is a new property under the management of J. P. Newell of Carthage, the stockholders being Eastern capitalists.

Some Joplin mining men are doing prospect work with a drill near Golden City in Barton county. It is not known at this time just what the outlook is in that part of the country, except that some lead is found on the surface.——The Chapman mine at Prosperity caved a few weeks ago and it has been discovered that the roof in one of the old drifts is practically a solid mass of ore and the work of removing this will be begun at once. This mine was one of the best producers in the district for several years, but at the time of the cave it was thought the orebody was about exhausted and had the accident not occurred, it is probable that the mine would have been abandoned.

Leadville, Colorado.

Camp Harrington.—Systematic Exploration.—Down Town Mining.—Increased Activity at Red Cliff.—The Upper Blue.—Progress a Kokomo.

For several months' past there has been unusual activity at Camp Harrington, the 'old camp' recently revived, six miles north of this city, on the Tennessee fork of the Arkansas river. Many years ago a large part of this district was prospected in a superficial way, with the result that no discoveries of importance were made. Many shallow shafts were sunk, but the mineral-bearing contact was not reached except in few cases. Developments of late prove the geological formations to resemble those common in the Leadville district proper, namely, porphyry, blue limestone, parting quartzite, and granite. The Lucy L. mine claims a record of more than $140,000, all of which came from a gash xein in the blue lime, but as the workings have not yet reached the contact, the consensus of opinion is that important orebodies will be opened up when the contact is reached. The Jennie June, a near neighbor to the Lucy L., is being developed in a substantial way by Colorado Springs parties, and within a few months the contact will be reached by the shaft now being sunk. Perhaps the most valuable, from the standpoint of determining the permanency and value of the camp, is the development work now being done on the Emma and Mabel placers, which embrace an area of more than 300 acres. An adit is being driven into Golden Gate hill from a point a few feet above the Cambrian quartzite. This adit is now in 170 ft., and it is the intention to raise at the 200-ft. point to the parting quartzite, unless the adit should cut it before reaching that distance. From this point a drift will be run north to cut the Lucy L. vein and south to cut the Jenny June vein. This enterprise is being promoted by the Harrington syndicate. The Leo shaft, near the head of California gulch, has been unwatered, and the drifts are being cleared for further development work. This shaft was sunk more than 20 years ago, and the new company, managed by W. S. Jones, controls 20 acres that it is proposed to develop through this shaft.

The Bohn shaft, on Toledo Ave., has been for years one of the most important of the 'down town' producers. This property, which is under lease to Leadville and Denver capitalists, has within the last few days let an important contract to Leadville miners to break the ore, which was formerly done by the company. There has been for some time more than 1,000 tons of rich silver-lead ore shipped monthly, and the results of late development work indicate a material increase in future shipments. The work of exploiting the lower workings has been much simplified and cheapened by complete drainage through the Penrose pumping plant.

Increased activity is noted among the Gillman properties above Red Cliff. A force of more than 40 men is now being employed on the Iron Mask alone, and shipments of ore will begin within a month. The orebodies of that district are similar in the character of their products to the zinc shoots of Leadville district proper. Although

the percentage of zinc is not high, the price of zinc at this time, coupled with the modern process of electrical separation, enables these ores to be shipped at a profit.

In the Upper Blue river district, northeast of Leadville, the principal properties in operation during the past year have been the Atlantic-Pacific, which ships its rich gold ores to Denver by way of Alma; the Senator, which has an adit over 4,000 ft. long, and shows several veins of milling ore; and the Wonderful-London, which is sinking a shaft for the ore-bearing contact. The shaft at 435 ft. is now in lime, and it is expected to encounter a blanket vein of ore underlying the lime.

Much interest centres in the Wilfley mill at Kokomo; the trial tests made with the new Wilfley roaster are reported to be successful. This furnace was designed to obviate the difficulties experienced from sintered ores, and is based upon the principle of the Stetefeldt furnace, well-known in the metallurgy of silver. The new 100-ton Breen mill is at last completed, and will add considerably to the force of men employed at Kokomo. The Kimberly company also has a force of 75 men rushing the building of the new 300-ton concentrator, which will be kept busy handling the low-grade ore, while the first-class ore from this property will be sent to the smelter at Leadville.

Johannesburg, Transvaal.

Brighter Outlook at Johannesburg.—Record Gold Output.—Details of Production.—An Alluvial Rush.—Indentured Chinese Stop Coming.—Progress in 1906.—Good Work of Tube-Mills.—Reduction in Costs.

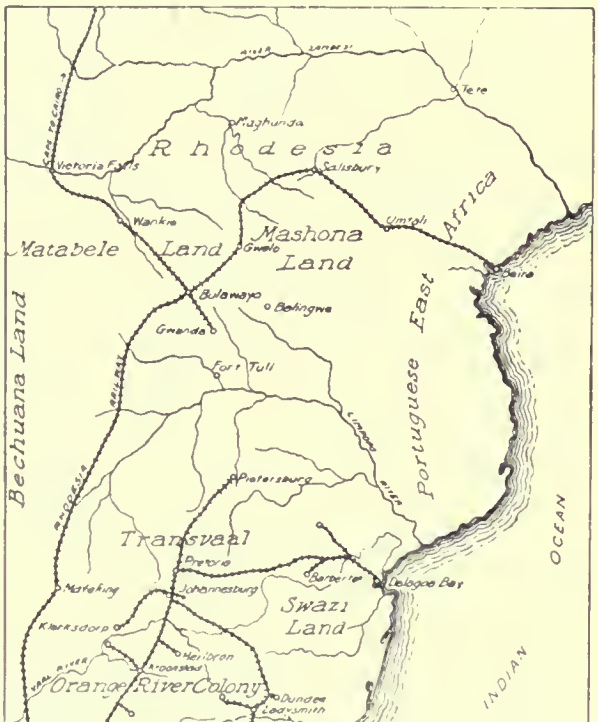
There appears to be less of gloom and more of hope in the situation here. Probably the results obtained by the gold mining industry in December have done a great deal to encourage the public. The total output of the Rand for December was declared at 529,521 oz., while the production of the rest of the country was 20,646 oz., making a grand total for the Transvaal of 550,167 oz., valued at £2,336,961. The December output makes a total of £24,492,288 as the value of the gold won in the Transvaal during the year 1906. It is highly improbable that either Australia or the United States will reach this figure, so that the Transvaal will easily be the premier gold producer of the world for 1906. There is an increase of 889,396 oz. over 1905.

During December there were at work in the Transvaal 8,410 stamps; of these 8,070 were on the Rand; and 340 in outside districts. There were 20 companies that declared an output of 10,000 oz. and over in December. The Simmer & Jack stands first on the list, with an output of 24,659 oz., valued at £104,744; next comes the Robinson mine, with an output of 20,768 oz., and third comes the Robinson Deep, with 20,211 oz. As usual there is a great variation on the different mines as regards the amount of waste rock sorted out. Only one mine, the Consolidated Langlaagte, put all its ore from the mine through the mill, making no attempt to discard the waste rock. The Princess Estate mine, on the other hand, where the reef is only one or two inches wide, and the stopes about thirty inches wide, reports a sorting percentage of 38 for December.

Some excitement was caused during the past month over alluvial gold. Several prospects have been found and syndicates formed to work them, but so far the outlook is not over bright for this phase of mining. Provided the gold is found in paying quantities, the difficulty in securing water will militate against the success of an alluvial enterprise. It is to be feared that this alluvial boom is more of the nature of a gamble and that very little will come of it.

During December the last batch of 2,000 coolies reached Durban from China. Until the policy of indentured labor is finally settled by the first Transvaal Parliament, no more Chinamen will come to the Rand. It is a significant fact that the organization for the recruiting of coolie labor in China is being kept up, showing that the leaders of the industry have every confidence that the new Parliament will decide in favor of the importation of indentured coolies. There were 52,889 indentured Chinamen in the employ of the mines on December 31, 1906. Could we be assured of a constant supply of 70,000 Chinamen, the Rand would be sufficiently supplied with unskilled labor, at least for the present, provided, of course, the same number of Kaffirs remain at work as at present.

The year 1906 proved to be the greatest in the history of the Rand. Were it not for the terrible apprehensions we passed through, due to the machinations of politicians, 1906 would stand as the red letter year of the Transvaal.



Map of the African Goldfields.

There was a distinct improvement in the extraction of gold; on some mines using tube-mills a total extraction of 94% was obtained. It seems that the tube-mills have bettered the extraction by at least 5%. The duty per stamp has also been greatly increased, one mine having reached a capacity of 8.5 tons per stamp in 24 hours. One of the most satisfactory features of 1906 was the reduction of working costs. This reduction has not been obtained by the sacrifice of efficiency, but by an all-round improvement in the working of the mines. The Chinese mines show up especially well in the question of working costs, on account of the increased efficiency of the coolies. On one large mine employing coolie labor the costs at first were 33s. per ton. On the same mine the working costs for 1906 were about 23s. 4d.

An unfortunate feature of 1906 was the enforced abandonment of work on developing mines, owing to the uncertainty of the unskilled labor supply. For political reasons principally, the eight-hour question became a pressing one during the year. A number of mines have adopted the eight-hour law, but it has not been an unqualified success, and on some mines the men are against the eight-hour day.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PARAGENESIS is the general term used in rock nomenclature for the order of formation of associated minerals.

A SIX-INCH GRADE is one commonly used in sluices. This means six inches to the box 12 ft. long, or about a 4% grade.

THE solution used in sensitizing paper for blue-prints generally contains ferricyanide of potassium and ammonio-citrate of iron.

THE strength of an explosive is measured by its specific volume, the amount of gas it produces, its temperature, and the rapidity of its evolution.

ORTHOCLASE alters to muscovite or kaolin, upon being exposed to weathering influences. In the change, water and carbonic acid are the only chemicals required.

THE smelters in Shasta county, California, formerly obtained silicious ores locally, now the supply is deficient. The Mountain Copper Co. gets silicious ore from Nevada, the Mammoth gets it from southern Oregon.

IT has been proved experimentally that, as a rule, the length of the charge of explosive to be placed in the blasting-hole, should not exceed 8 to 12 times the diameter, for single holes. That is, a one-inch hole should never have more than 12 inches of explosive placed in it.

THE burning of oil as fuel will induce the rusting of iron, within the reach of the escaping gases. Crude oil contains 2½% sulphur—more of it than coal—and as it escapes in the form of sulphur di-oxide, accompanied or in the presence of water, it readily forms iron sulphate when in contact with iron.

THE aneroid barometer can be of service to a placer miner, as was proved by John R. Harvey, in Oregon. He kept the aneroid in his office, and, seeing it fall suddenly one day, he ordered his waste gates to be opened, and this was done just in time, for a storm wrecked all the other water systems in that part of the country.

THE St. Gothard tunnel is 48,840 ft. long, and was run from the two ends only. The face was broken for an area 26 by 20 ft., and was driven at the rate of 18 ft. per day, the work including the placing of 1,000 cu. ft. of timber and 300 tons of masonry per day, and the transportation of 750 tons of broken rock, 15 tons of lumber, and 300 tons of masonry.

A NEW incandescent lamp, called 'helion' on account of the resemblance of its spectrum to that of the sun, has been developed in the physical laboratories of Columbia University. The filament is not metallic, but can be operated with efficiency at a low temperature. A special carbon filament is used as a base, and upon it is deposited silicon. The lamp gives a very white light.

WROUGHT-IRON PIPES have the advantage over cast-iron in pliability, lightness, and toughness. They are easier to handle, and cheaper per foot notwithstanding that their cost per ton is about 25% greater. Also, they may be made in lengths of from 15 to 18 ft., instead of 12 ft., making fewer joints per mile, and possess the additional advantage that they may be bent through angles up to 25 degrees.

PEOPLE will make, without verification, statements that it is easy to verify; for instance, it is asserted that this or that ore contains tellurides. It is one of the easiest of tests to determine this fact. Put a bit of the mineral on a porcelain saucer and add a couple of drops of strong sulphuric acid. A ruby coloration indicates the presence of tellurium; the absence of it is proof conclusive that the mineral is not a telluride.

IN small compressors the inlet and outlet valves are generally controlled by springs; as the inlets are horizontal, the spring, in addition to overcoming the friction due to the weight of the valve, must be strong enough to close it sharply. That this spring tension is not a negligible quantity when multiplied by the area of the piston and its stroke, is proved when the inlet springs are even slightly tightened on an ungoverned compressor; the revolutions per minute at once decrease.

PURE nitro-glycerine is odorless, nearly colorless, and has a sweetish, burning taste. It is poisonous, even in very small quantities, and headaches commonly result from handling it. It is insoluble in water, takes fire at 306° F., and, if unconfined, burns harmlessly, unless heated to 380° F., which is the exploding point. The presence of surplus acid, not properly removed in the course of manufacture, renders the nitro-glycerine liable to spontaneous disintegration, which, by increasing the temperature, increases the danger of premature explosion.

IN cases where a large number of drills are used by a company, the cost of keeping them in repair may be as low as $12 per month per drill, provided they are operated by skilled men. This would be distributed about as follows: Supplies for repairs, $1.50; machinist labor, $8.50; and blacksmith labor, $1.75. Many companies figure that where few drills are operated and renewal parts are purchased from the manufacturers, the cost of repairs averages about 50c. per drill per shift. In South Africa, where each drill works two shifts per day, the cost of repairs is $300 per drill per year.

WITH the beginning of the present year, the Government internal revenue tax on denatured alcohol was removed, making the question of alcohol fuel one of immediate interest. The ordinary gasoline engine will not use alcohol economically, and probably the coming year will see new types of engines especially designed for this purpose, and an arrangement for the production of a denatured spirit at a price that will enable it to compete with gasoline. The alcohol possesses considerably less heat value, as compared with gasoline, but the efficiency of the engine may be increased in the case of the alcohol, by increasing the compression.

THE nitro-glycerine in dynamite freezes at 42 to 46°. When it is frozen it cannot be exploded by the ordinary caps used in blasting, but it is extremely sensitive to friction or to any breaking or cutting of the cartridge. Accidents are common in thawing dynamite. It should never be thawed by plunging the sticks into hot water, as the nitro-glycerine leaks out, and many accidents have resulted from re-heating water which has been used in a dynamite thawer. It is also unwise to hold the sticks over a hot body, for the purpose of thawing them, as the nitro-glycerine will leak out, and it is extremely sensitive then to shock and heat, and one drop falling even a short distance upon a hot object, will explode, and thus set off any dynamite that may be near. Low-grade dynamite, 40% and under, is safer than high-grade, as the base is not so thoroughly saturated with nitro-glycerine, and the sticks are not so apt to leak.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Sampling and Assaying of a Car of Bonanza Ore.

The Editor:

Sir—Much interest having been aroused by the recent shipment to the smelter of the Selby S. & L. Co., San Francisco, of the so-called "million dollar" car of ore, I thought it might be of interest to the readers of the MINING AND SCIENTIFIC PRESS to know how such a car of ore was sampled and assayed, and how closely the assays would agree. I have therefore obtained permission from the management of the Mohawk Mining Co. to publish the following data.

The ore came from the famous Hayes & Monette lease of the Mohawk mine at Goldfield, Nevada, and was shipped by Wells Fargo & Co. express, requiring three of the ordinary baggage cars to convey it to the smelter. It could, however, have been shipped in one of the modern freight cars, had its value permitted, as the total gross weight was only a few pounds in excess of 50 tons.

In sampling, the shipment was divided into ten lots of approximately five tons each, and each lot sampled according to the following method: The whole lot was passed through rolls crushing to pass a quarter-inch screen, then shoveled over and coned twice on a floor covered with iron plate in order to thoroughly mix. It was then cut down on riffles of the Brunton design to about one-fifth, or 2,000 lb. This was again crushed by rolls reducing to about 10 mesh, and again shoveled and coned twice. After this mixing it was divided by the riffles into two portions of 1,000 lb. each, and each of these again cut in two in the same manner, giving four samples of about 500 lb. weight. Each of these was treated as an independent sample, and was riffled down to about 20 to 25 lb. taken to the pulping room, dried and ground in a sample grinder to pass 100 mesh; from this four pulps were taken, one for the smelter, one for Hayes & Monette, and one for the Mohawk Mining Co., while the fourth pulp was set away for umpire in case of differences. There were, therefore, 16 pulp samples for each lot of five tons, of which 12 were assayed. The results all agreed so closely that no umpires were called for.

In assaying, the Selby smelter, of course, had its own assayers; Hayes & Monette brought with them Mr. Downer, of Downer Bros., Goldfield, who leased the laboratory of the James & Gray Co., of San Francisco, in order to do the work himself, while I represented the Mohawk Mining Co., running the assays in my own laboratory at Oakland. I failed to take copies of the assays on each pulp made by the other assayers, but I have tabulated below the averages of the four samples of each lot, which was the basis upon which settlement was made by the smelter. I may say that the checks on each pulp representing one of the four samples of the lot, checked as closely as these averages, and in many cases were within a few hundredths of an ounce. Occasionally one of the four pulps would vary materially from the other three, and this difference, while shown in the returns of each of the assayers, would disagree usually, much more than the differences on the other samples of that lot. This accounts for some of the greater differences, especially in lots 3,421 and 3,424, where both Selby and I found pulps from No. 3 and No. 2 samples, respectively, very much lower than the other samples. While Mr. Downer's returns on these samples were lower than on the others of these lots, still he did not have the differences that both Selby and I found, and which brought our averages much below his. On the individual samples of these lots Selby and I agreed quite closely, especially on the samples of lot 3,421, where our averages check within four-hundredths of an ounce.

Lot number.	Selby.		Downer.		King.	
	Gold. Oz.	Silver. Oz.	Gold. Oz.	Silver. Oz.	Gold. Oz.	Silver. Oz.
3,416	558.30	71.10	561.22	62.82	559.81	69.31
3,417	716.77	87.40	718.32	84.93	718.16	86.75
3,418	529.15	69.80	527.74	69.20	530.07	68.23
3,419	491.87	64.52	490.99	57.55	492.59	62.02
3,420	497.95	63.10	500.72	56.28	499.15	61.96
3,421	824.55	92.80	828.21	90.39	824.59	91.85
3,422	770.75	82.32	771.56	88.02	769.55	84.96
3,423	564.72	76.52	567.87	70.83	565.08	74.36
3,424	592.00	75.00	601.45	71.71	593.86	73.35
3,425	533.50	70.10	534.21	68.90	533.32	68.44
Average ...	607.956	75.266	610.229	72.063	608.618	74.123

Selby is lowest on gold six times; on silver once.
Downer " " " twice; " " seven times.
King " " " twice; " " twice.
Selby is highest on gold no times. on silver nine times.
Downer " " " eight "; " " once.
King " " " twice; " " none.

Selby and Downer check within one ounce twice, the closest being 0.71 gold; while four times it is greater than 3 oz., the greatest being 7.59 ounces.

Selby and King check within one ounce five times, the closest being 0.04 oz.; while in no case is the difference greater than 2 oz., the greatest being 1.86 ounce.

King and Downer check within one ounce twice, the closest being 0.16 oz.; four times the difference is greater than 2 oz., and twice it is greater than 3 oz., the greatest difference being 7.59 ounces.

In only one instance do all three check within one ounce, and four times do they check within 2 oz. This of course has reference to the gold.

In assaying the first few lots I used both ½ A. T. and ⅒ A. T. charges in crucibles, but as the quarters checked as closely as the tenths I adopted the quarter assay-ton charges for the rest, as the error would be multiplied more by the use of tenths. Notwithstanding that the gold is present almost entirely as a telluride, I experienced no difficulty in the cupellations, except that in the doré buttons, it was impossible to get 'feathers' on the cupel.

Selby, I believe, used tenths, and that may account for their slightly higher results on the silver, though Mr. Downer also ran tenths, and he is the lowest on the silver. He explains this by the furnace he was using, having a small muffle, fired by gas, and the manipulation of which he was not accustomed to. Selby used large muffle furnaces fired by coke, and I, a furnace of my own design, double muffle fired by gasoline, the lower muffle holding fourteen 20-gram crucibles, and the upper muffle for cupellation being 9 by 15 by 5¾ inches.

I used a very basic litharge flux, giving a gentle slow heat for 30 minutes and a high heat for 20 minutes, throwing down about a 25-gram lead button. Six fusions were run on each sample, four being alloyed in the crucible from which the gold was determined. Three times as much silver as there was gold present was used in alloying. The beads were treated as in the bullion assay, being rolled into cornets, and parted with two acids.

The checks on the different samples of the same lot were usually quite close, but occasionally one of the four samples would vary considerably from the other three, as shown in the following:

Lot number.	Sample 1.	Sample 2.	Sample 3.	Sample 4.
3,416	562.92	562.27	564.90	549.15
3,421	830.84	827.94	812.56	827.04

As remarked above, this difference was shown in the assays of the other assayers and corresponds with the same number of samples.

The checks in milligrams on the different buttons are interesting:

Lot No. 3,416 ....140.81; 141.12; 140.98; 143.73 being sample No. 1.
" " 137.24; 137.52; 137.10; 137.55 " " " 4.
" " 3,418 ....132.70; 132.68; 132.51; 132.15
" " 3,417 ....180.52; 180.90; 181.10; 180.84

Occasionally the beads would fail to agree within several milligrams on the first fusion, but upon repeating they would check, showing that it was due to faulty manipulation and not to spottiness of the ore.

Selby claims to have made correction for surcharge of silver in the parted buttons, which might account in part for the average difference between them and myself; they did not, however, correct for the cupel and slag losses which I found to be in cupel 0.4 oz. gold, and in the slag 0.05 oz. gold, or when calculated to the ton it would be 1.80 oz. gold. I, of course, did not correct for this either, as I knew Selby would not allow for it.

While the assays show that the total value of this shipment is less than a million dollars, yet it is well above $600,000, and I am told exceeds in richness that of any other shipment in the world for the same tonnage.

LOCHIEL M. KING.

1311 Franklin St., Oakland, Cal., February 11.

In Defence of Greenwater.

The Editor:

Sir—You will doubtless pardon my presumptiousness in daring to intercept your unfavorable editorial opinion on the great "Greenwater Country," but feeling assured that I have men at my back, who perhaps have collectively nearly as much gray matter in their cranium as the somewhat considered eratic Mr. James W. Abbott, I will venture to arouse your augmentive abilities.

Perhaps for your present consideration, it might serve the purpose of refuting the many absurd, unkind, ungentlemanly and unjust statements of Mr. Abbott, for me to inclose a recent contribution of mine to the "Anaconda Standard."

Pardon me for remarking, but you say Mr. Abbott is unprejudiced and a man of ability. After a careful perusal of his article I believe you are wrong. The venom of the cynic, disgruntled and unsociable man crops out in his almost every phrase.

Expecting your gentlemanly courtesy, in the reproduction of my article in answer to Mr. Abbott, I remain,

E. L. HEWS.

Greenwater, February 10.

(Here follows a portion of the article mentioned)

"In the whole record of mining history, no such prima facie evidence of an extensive fabulously rich deposit of the earth's precious metals has been revealed to man as the observation, investigation and development in the Greenwater mining district have shown. To the north is their environment of gold; to the west are their copper, borax and chemical deposits of Death valley; to the south and east and southeast and southwest are their copper, gold, silver and, perhaps, precious stones. The same ozone of God has combined with associate forces and with their almighty force disintegrated, changed and altered out of their original magma the various mineral depositions as they have in Butte and the universe. The geologist forsakes his theoretics of years. To classify is subject to a disputation, and he can only rely on the laboratory man to give him the truth or falsity of his deductions. The country traveled in coming from the great parent town of the desert mining of recent years, Tonopah, shows where at one time the blast furnaces of nature were at work. * * * The lava flow becomes less and less apparent as we travel westward, and the eroded strata and geyser depositions of conglomerate hydrostatic andesite copper. Oxide of iron stains many parts of the cappings, and to the newcomer the country looks decidedly promising. It has been my fortunate opportunity to traverse these hills and find that in a large part of the Greenwater mining district the copper-bearing appearance is general. Along the line of the ascending and descending waters is found an altered intrusive diorite."

[Except for correcting the spelling of Mr. Jas. W. Abbott's name, we publish Mr. Hews' letter exactly as received. If this is the best that can be said for Greenwater, it is in a bad way. We have not space for the whole of Mr. Hews' contribution to the *Anaconda Standard*, but we publish sufficient of it to indicate a curious familiarity with the purpose of the Almighty and a profound knowledge of the structure of the universe. What was the matter with the editor of the *Anaconda Standard*? —Editor.]

A Curious Occurrence of Copper.

The Editor:

Sir—In your issue of November 24, W. W. Rush writes of a 'curious occurrence of copper' in Alaska. It may interest some to know that a similar occurrence has been noted near Shingle Springs, in Eldorado county, California.

On a claim owned by C. F. Staver, Emmet Davies, and others, there is a belt of serpentine in the amphibolite, typical of that region. The serpentine carries as its sole mineral content fine flakes of bornite. There is no apparent alteration, and the bornite appears to be a primary ore. There are several old shafts on the property, it having been worked in the '60s, during the copper boom. The ore is similar wherever met with. During the past year this attracted the attention of several mining men of ability and experience. As a concentrating proposition, it lacks the usual iron sulphides. Perhaps others have noticed a similar occurrence.

C. Y. KNIGHT.

New York, February 11.

THE UNIVERSITY must be cosmopolitan in its composition and catholic in its range. Knowledge is only divorced from practice by a shallow philosophy, for no true learning is without its value in practical life. Literature gives not only a freemasonry of spirit and understanding, but a perpetual stimulus to the mind. History shows us morals writ large in the fate of nations, philosophy gives perspective and elevation. All alike give the student a sense of the unseen, of the things of the spirit, which add dignity to service, inspiration to work, purpose to suffering, a value, immeasurable and eternal, to the humblest of human lives. This is the true aim of University education, the training of the mind and character, not the turning out of so many experts in so many branches. Knowledge must be sought single-heartedly for its own sake, and not for its usefulness in the world, for it will fail of that usefulness if it is pursued in any narrow commercial spirit.—Henry Asquith.

THE chief reducing agents used in assaying, for reducing litharge to metallic lead in the crucible are: Argol; charcoal or coke or coal-dust; and flour or sugar. The amount to be used in the charge depends on the weight of the lead button that it is wished to produce. One gram of argol will reduce 5.45 grams of lead from 5.85 or more grams of PbO, when the argol is a pure bitartrate of potassium. But as it often contains carbonaceous matter, its reducing power may be from 7 to 9.5 grams lead to one of argol. One gram of charcoal will reduce 34.1 grams of lead, which in practice is found to range between 20 and 30 grams, on account of the presence of inert ash in the charcoal. Flour will reduce from 9 to 12 grams of lead per gram of flour, and it is therefore about twice as effective as argol, using equal weights of each.

Progress in the Coeur d'Alene.

STAFF CORRESPONDENCE.

Shipments of high-grade ore and concentrates from the Cœur d'Alene mining region of northern Idaho during 1906 amounted to 250,000 tons, of an average content of 50% lead and 25 oz. silver. The principal mines have been producing up to the limit of their milling capacities and they are not expected to increase their output in 1907. However, there will be an increase in the production of the newer companies which are developing their mines and building mills. The most marked developments on new property are in the vicinity of Burke and Mullan; and the prospect of a railroad being built to the Murray district this year is giving impetus to development in that part of the Cœur d'Alene. The larger mines of the region, namely, those of the Federal Mining & Smelting Co., Bunker Hill & Sullivan Mining & Concentrating Co., and the Hercules Mining Co. are understood to be under contract to ship their products to the plants of the American Smelting & Refining Co., but it may be noted that the United States Smelting, Refining & Mining Co. has entered this field as an ore buyer and is now taking the concentrate and high-grade ore of the Hecla at Burke, the Gold Hunter at Mullan, and those of some smaller properties.

The discovery of a copper producing zone some three miles east of Mullan, as testified by the development and production of the Snowstorm mine, has had the effect of attracting men and money from other copper mining regions, notably Butte; and the thorough exploration of that belt, both east and west from the Snowstorm, will certainly take place this year. It strikes in the direction of Burke and the uncovering of both lead and copper ores, associated together, west of the Snowstorm has created an interest that increases as the work progresses.

The Snowstorm, of which W. D. Greenough, of Mullan, is manager, is opened through a series of adit-levels, No. 1, 2, and 3. No. 3 is 723 ft. vertically below No. 2. The carbonate, or leaching ore, comes from levels No. 1 and 2, and carries 2.65% copper and 4.5 oz. silver. The ore in No. 3 level is a heavy sulphide. The vein stands nearly vertical and is said to range in width from 20 to 75 ft. The leaching plant, which is considered a success, will be handling 200 tons per day by February 15. The company ships about 250 tons per day of crude ore that is a mixture of carbonate and sulphide, running 4% copper and 6 oz. silver. It runs 90% silica and is received at the various smelters for use as converter lining. The company has expended $300,000 in equipment and improvement, and the manager now recommends to the stockholders that a concentrator and smelter be erected. No. 4 level, starting 3,000 ft. down the gulch from the portal of No. 3, has been driven 900 ft. and must be driven 2,500 ft. farther to cut the vein 600 ft. vertically below No. 3. Work is progressing on this. Mr. Greenough states that the mine is in condition to produce 2,000 tons of ore per day.

Wardner, Idaho. In the Coeur d'Alene.

The Gold Hunter M. & S. Co. is driving what is called No. 6 cross-cut to intersect the vein 700 ft. below the old workings. It is expected that work will be finished by September 1. This company employs 100 men, and mills its entire output of 200 tons per day. James Gearon, of Mullan, is manager.

The Hecla mine, at Burke, of which James F. McCarthy, of Wallace, is manager, has the only electrically operated hoist in the district. It is a converted steam-hoist, having flat cable, positive clutch, 300-h.p. motor, and operates to a depth of 1,000 ft. They also operate electric pumps at the 600 and 900 levels. The ore is hoisted to a landing 58 ft. above the collar of the shaft, then dumped upon a three-inch grizzly, the oversize going to a sorting belt from which the high-grade and waste are taken, the balance going to the mill-bin; the undersize goes to a one-inch grizzly that divides it for the coarse and fine sorting belts. By this method of sorting about 15 tons per day of high-grade are taken out for shipment and 25 tons per day of waste are eliminated.

The mill ore, sized and freed from waste, amounts to 300 tons per day. P. C. Schools, master mechanic, who likewise has charge of all electrical equipment, states that the application of electric power to hoisting has proved successful and satisfactory. The mine workings, including prospecting work, extend 3,000 ft. east from the shaft. The Hecla mill, at Gem, embodies equipment for the usual method of grinding, sizing, and concentrating by jigs, tables, and vanners. The principal change of late has been the installation of Callow screens and Callow settlers. The screens supplant the old system of hydraulic sizing.

The Hercules mill, a mile above Burke, has two bins, one for high-grade and the other for mill ore, transported over a surface tramway. The first class runs about 60% lead and 50 oz. silver; and the mill ore carries 6.5% lead and 7 oz. silver. A crusher, 9 by 15 in., reduces the ore to proper size for trommels and rolls. The ore feeds from a storage-bin to a double-screen trommel, the first two sections of which are 18 mm., whose undersize passes to an elevator; the undersize from the third section goes to a 36-mm. jig, the oversize to 16 by 36-in. Humphrey rolls. The middlings from 'bull' jigs pass to Humphrey rolls and its product by elevator to a three-section trommel; the first two sections are 12 mm., the third being 20 mm. The product of the 20-mm. size passes to two jigs, the oversize from this trommel to another 'bull' jig. What passes through the 12-mm. screen goes to the 36-in. twin trommel of 3 and 5 mm. The 3-mm. product goes to hydraulic classifiers and the 5-mm. product to jigs. On the jig floor are 12 sets of Hartz jigs. Callow screens are being put in to make a sized product for the tables, of which there are 18 Wilfleys. The middling from the jigs is re-ground in centrifugal high-speed rolls and a Huntington mill, the product of the latter passing to the tables. Frank Franz, mill foreman, states that the jigs make a 60% lead product. H. L. Day, of Wallace, is general manager of the Hercules.

The Frisco Mining Co., Ltd., of which Frederick Burbidge is manager, has partially re-equipped its mill near Gem, and at the time of the writer's visit was ready to resume operations. The mill was formerly operated as a lead concentrator, but it will now make a zinc concentrate as well. The ore from its mine carries 15% zinc, 8% lead, and 6 oz. silver. Recent additions to the mill's equipment comprise 6 Callow screens, 7 circular settling vats, 10 Wilfley tables, and one Dings' magnetic separator. The iron associated with the zinc is magnetic and this makes it possible to magnetically extract the greater part of it before passing the remainder to ordinary wet concentration. It is expected that from 60 to 70% of the zinc in the ore will be saved in a concentrate running about 45% zinc. The Frisco mine is 1,400 ft. deep, and is being sunk 200 ft. deeper. Electric pumps will be installed within the next 30 days. The company has been shipping some high-grade ore.

The Federal Mining & Smelting Co., of which W. Clayton Miller is general manager, has its general offices at Wallace and operates the Tiger mine at Burke; the Standard and Mammoth mines at Mace; the Morning mine at Mullan, and the Last Chance mine at Wardner. These mines produced 18% of the lead product of the United States in 1906. The 2,000-ft. shaft of the Tiger mine is being sunk 200 ft. deeper; the orebodies of the Mace mines are said to be much longer in the lower workings than they were on the upper levels. At the Morning mine No. 6 cross-cut, starting at the mill-level, has been advanced 2¼ miles to the main working shaft. The company is installing electric haulage and before this appears in print all ore from the mine will be conveyed to the mill and shipping bins through this No. 6 adit. This arrangement will cause a discontinuance of the use of the surface railroad, which has so long been operated in hauling ore and supplies between the mill and the upper levels. The change will bring about greater economy in getting the ore from mine to mill. The company's Tiger mill handles about 6,000 tons per month, its two mills at Wallace handle 28,000 tons per month, the Morning mill 27,000 tons, and the Last Chance mill between 13,000 and 14,000 tons, making an aggregate of 64,500 tons per month. The new slime plant at the Morning mill re-grinds and re-treats the fine jig tailing, using Huntington mills and the Callow system of sizing and settling, the products passing to Wilfley tables and vanners. In this way about 200 tons of slime per day is re-treated, making about 11 tons of fine concentrate per day that formerly passed into the river. This slime concentrate runs about 40 to 43% lead.

The Bunker Hill & Sullivan Mining & Concentrating

The Coeur d'Alene, Idaho.

Co., whose mines are at Wardner and mill at Kellogg, mined 919,039 tons of milling ore and 20,000 tons of shipping ore in 1906. Its product in that period amounted to 79,560,209 lb. of lead, 1,598,788 oz. silver, of a total value of $4,802,052. The dividends paid for the same period amounted to $7.80 per share, or $2,340,000. Stanly A. Easton, general manager of the company, states that the year's production was kept down somewhat by fires in some of the stopes last spring. Within the year large sums were spent in mine development and surface improvement, the latter including a new auxiliary concentrator to work over the one million tons of accumulated tailing stored near the main mill, and for re-treating part of the tailing product of the latter. The new plant, which is about ready for operating, has a capacity of 1,000 tons per 24 hours. It is equipped with four 6-ft. Huntington mills of the Anaconda type, Callow screens and vats for pulp classification and thickening, 16 Frue vanners, and 24 Wilfley tables. The accumulated tailing will first be treated in jigs without previous grinding, the jig product being ground in

Huntingtons before final treatment. General Electric Co. induction motors are installed to drive the machinery, the power being transmitted from the generators at Spokane falls. The most important mine development of the year was the sinking of an incline winze 400 ft. below the level of the Kellogg adit; and the opening of levels at 200 and 400 stations on this winze and the finding of ore on both levels.

The Surprise Mining Co., controlled by M. J. Sinclair and W. J. McLean, of Kellogg, has a property lying just back of Kellogg peak, on Pine creek. It adjoins the Highland Chief and is about two miles from the pay ground of the Bunker Hill & Sullivan. Its vein cuts through quartzite and slate and has been opened by crosscuts, disclosing a lead-zinc sulphide. The intention is to erect a concentrating mill early this spring.

The Success mill, on Nine Mile, near Wallace, is operating on a complex ore of zinc, lead, and iron, carried in a quartzite gangue. It is essentially a zinc-lead ore and the mill makes one concentrate running about 46% zinc, 1½% lead; also a concentrate having 50% lead and 28 oz. silver. The mill can handle 200 tons of ore per day and has a crusher, two sets of rolls, ten Willfley tables, three Callow screens, three Callow vats, and Hartz jigs. They have shipped as high as 40 tons of concentrate per day. H. F. Samuels, of Wallace, is in control of the property.

The Pittsburg Lead Co., operating the Black Cloud mine, on Nine Mile creek, has been doing important development work during the last year under general direction Stanly A. Easton, and it is understood their mill near Wallace will soon start up.

As a dynamo, by reversal of current, becomes a motor, so a steam-engine may become a compressor—the action may be noticed in a locomotive running light downhill; as originally made, compressors were ordinary steam-engines with air cylinders attached. At first sight it might appear that an engine working with 90 lb. of steam is subject to the same strain as a compressor delivering at that pressure; but the massive build of a well-designed compressor points to a different conclusion. In the engine the piston is receding from a decreasing pressure, in the compressor advancing against an increasing resistance; in the engine the load resists going forward, in the compressor it actively pushes backward; and in the latter the maximum steam and air pressures occur at opposite ends of the stroke, one being highest when the other is lowest, the balance being transmitted through the bed-plate and connections.

It has often been asserted that dredging of river-flats ruins the land for all time. That such is not the case in Southland the following extract from a recent issue of the *Standard* will show: "The trees planted on the tailings of the dredging claims on Mr. Sheddan's property at Waikaka Valley are growing lustily and are making a good show at present. The larch-trees in particular are looking well. Their appearance certainly assists to explode the belief that dredge-tailings are absolutely irreclaimable. Although retarded by the uneven surface, good rough grass is springing up among the tailings. There is little doubt that dredged land could be brought back to a good deal of its original pastoral productiveness at very little expense, represented by harrowing and some clod-breaking. Natural grasses are growing wonderfully on a lot of dredge-tailings in the district, and there is no reason to believe that English grasses would not thrive as well with a little expense in leveling the surface. For tilling purposes, of course, the land could not be sufficiently redeemed, but the argument is often urged by some of our politicians who are not too well informed on the subject that the dredging of land irreclaimably ruins it. Such is not the case. A good deal of the land in this district, notably in Wainumu and Charlton, and parts of Waikaka, is so swampy and broken that it is almost useless for pastoral purposes."—*The New Zealand Mines Record.*

Town of Burke. Tiger Mine to the Left, Hecla to the Right.

Shaft-Building by Raising.

Written for the MINING AND SCIENTIFIC PRESS
By W. H. STORMS.

To the enquiry of your correspondent at Weheville, Wash., relative to a method of shaft-building by means of raising, I venture to submit what I know to be a practicable scheme for accomplishing such work in a safe and expeditious manner. As I understand it, the raise is to have two compartments, but the enquirer neglects to state whether the raise is to be vertical or inclined.

Assuming that it is to be driven vertically upward, presumably at the side or end of an adit 500 ft. long, proceed as follows: At the place selected for beginning the raise, cut out a station large enough to accommodate the loading-chutes, car-tracks, and timbers, if the latter are neeessary. If only a single traek of 18-in. gauge is to be used, the station need not be more than 10 ft. long, 7 ft. wide, and 9 ft. high. If cars are to be loaded in trains and two tracks are required, it will be needed to cut the station 10 ft. wide. Should a track of wider gauge than

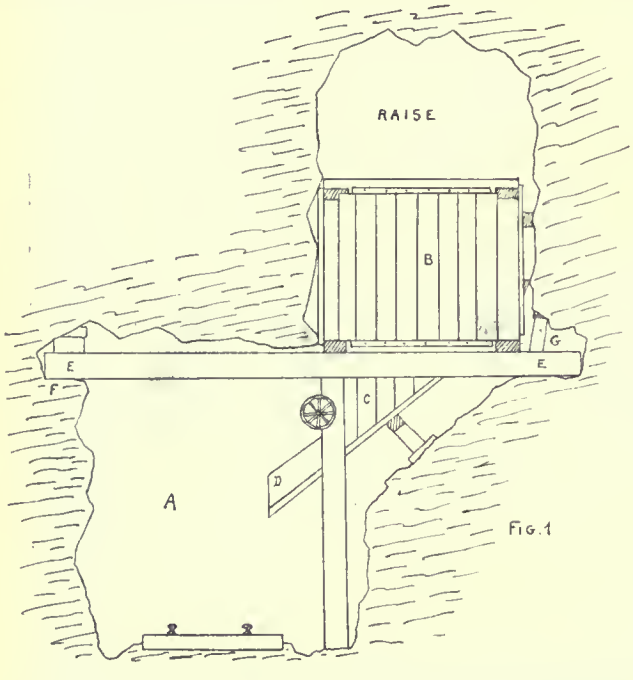


FIG. 1

18 in. be contemplated, the station must be correspondingly wider, but it need not be longer nor higher than the dimensions previously given.

The station forms a part of the adit, but the raise—to be later converted into a shaft—must be started above, and at one side of the station. The accompanying sketch (Fig. 1) shows the arrangement of shaft and chute-timbers, and the relative position of shaft and station.

When the raise has been started, as shown, hitches should be cut each end of the shaft at *F* and *G*, to hold long heavy timbers, *E*, the dimensions of which must be determined by the character of the ground. If in hard and firm rock, timbers 8 by 10 in. (8 in. side up) will be large enough; if the ground be soft and heavy, the timbers must be larger, and the hitches cut deeper, and they may even require heavy posts beneath, as these bearers may have to support the shaft for a distance of 50 or 60 ft. above the top of the station. The bearers also form a solid back for the ore-bin and chute-timbers. Beneath the raise the rock may be blasted out, sloping back from the station, as shown in Fig. 1.

Up to the time the raise has advanced upward 12 ft. all the rock broken should be shoveled into cars from boards placed on the floor for this purpose. The bearers should then be put in place in the hitches *F* and *G*, and firmly wedged. Care must be taken that the bearers are perfectly level, and that they conform exactly to the inside vertical lines of the proposed shaft. The size of the raise is optional, but should be suited to the amount of work proposed to be done through it. A shaft having two compartments, each 4 by 5 ft., is a convenient size and large enough for ordinary purposes. This will make a shaft 5 ft. by 8 ft. 8 in. clear, including an 8-in. divider.

When the raise has been cut 12 ft. above the back of the station, that is, the level of the bearers, and these latter are in place, the first set of shaft-timbers must be placed in position. This set comprises two wall-plates, two end-plates, a divider, separating the two compartments, and four posts. If 8 by 8 in. timbers be used, the wall-plates will be 10 ft. long, the end-plates 6 by 4 in. long, and the divider 5 ft. 2½ in. long, including tenons.

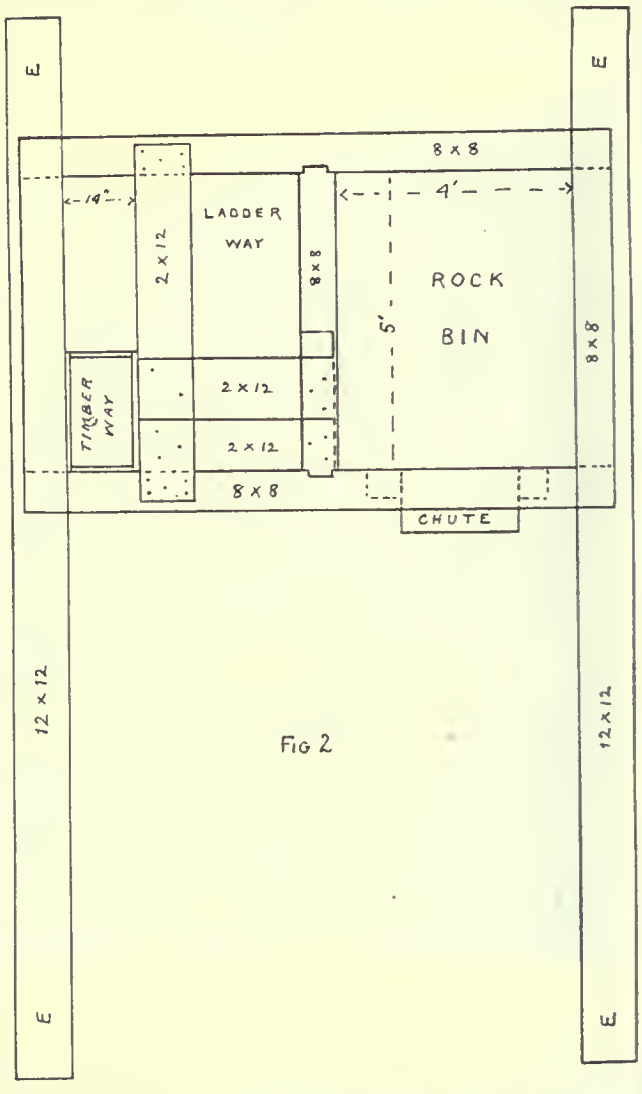


FIG 2

Fig. 2 shows a plan of the shaft at the level of the bearers.

The style of framing timbers is left to the miner. Either the overlap or the dovetail corner is good. The latter is particularly applicable to inclines, but may also be safely used in vertical shafts and requires a little less timber than the overlap. Fig. 3 shows the manner of framing plates for the overlap, and Fig. 4 illustrates the dovetail.

When the lowest set of plates has been fixed in position, resting on the bearers, and securely wedged, set up the four posts, being careful that they rest squarely in the daps cut for them on the ends of the low plates. The posts may be temporarily secured in position by means of 1 by 4 in. strips nailed to plates and posts, forming braces. On these four posts now place the timbers constituting the second set of plates; block and wedge them firmly, as with the lower set. Remove the 1 by 4 braces, put lagging in position, all around the shaft if necessary, and secure it by placing blocks of wood, rocks, or wedges

between the lagging and the rock-walls of the shaft. Much time may often be saved by nailing a strip 2 by 2 in. horizontally on the outer side of each plate, both ends and sides, placing them about the centre of the plates, making the strips nearly as long as the timbers. On these the lagging may rest and be blocked to place with little trouble and no loss of time. When the lagging is all in place the first shaft set is complete.

Build the rock-bin beneath one compartment, as shown in Fig. 2, the other compartment to be used as a man-

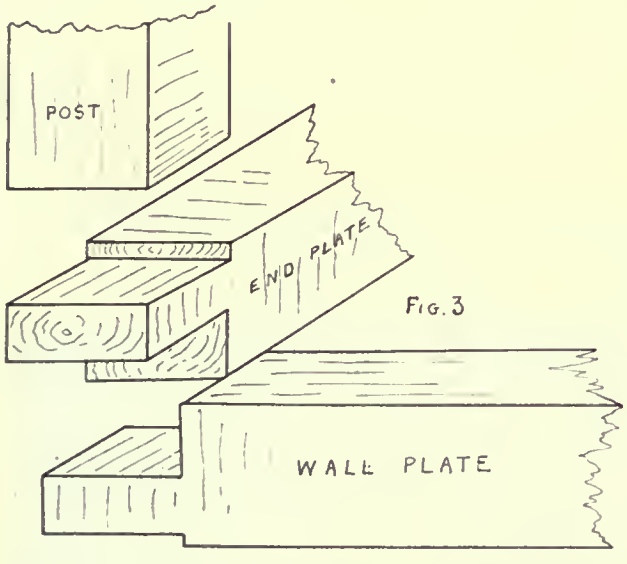


FIG. 3

way, and for the accommodation of pipes, wires, and ladders; also as a passage-way for timbers, and to raise and lower machine-drills and other tools.

Place a ladder on the floor of the station leading up to the first set. It may be placed in any desired position

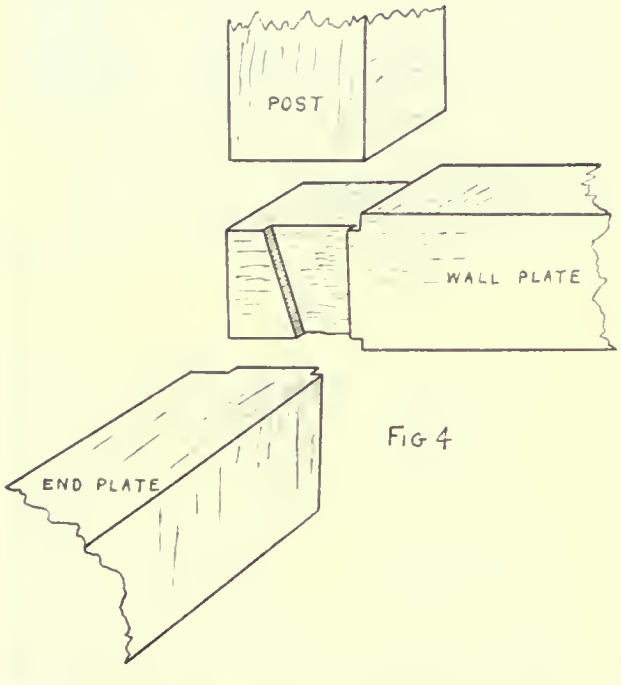


FIG 4

clear of the track. Two movable ladders must now be provided, to be used as the work progresses, one about 6 ft. 6 in. long, the other about 12 ft. Ladders made of 2 by 4 in. scantling with 1 by 4 in. steps are commonly used, the steps being set flush. The space between the sides should be at least 14 in. and the distance from the top of one step to the top of the next should not exceed 12 in. A number of ladders should be made for permanent use, 16 ft. 6 in. long, that is, to reach the height of three sets, when the ladder rests at an inclination of 70°. In vertical shafts, strong and properly made ladders are an absolute necessity. Never place ladders vertically when they can be set at an inclination.

It may be as well to explain here how ladders should be placed in a vertical shaft. Put them in the man-way compartment and on the side adjoining the dividers. This leaves the other end of the same compartment open for pipes, and for the passing of timbers, tools, and supplies, while the raise is in process of being driven. At every third set above the first spike a 2 by 12 in. plank across the shaft parallel with the dividers and 22 in. from it; on the divider spike a piece of 2 by 4 in. plank 24 in. long. Across these spike, side by side, and parallel with the wall-plates, two pieces of 2 by 12, 40 in. long, and at one side of the shaft. This leaves a man-hole at

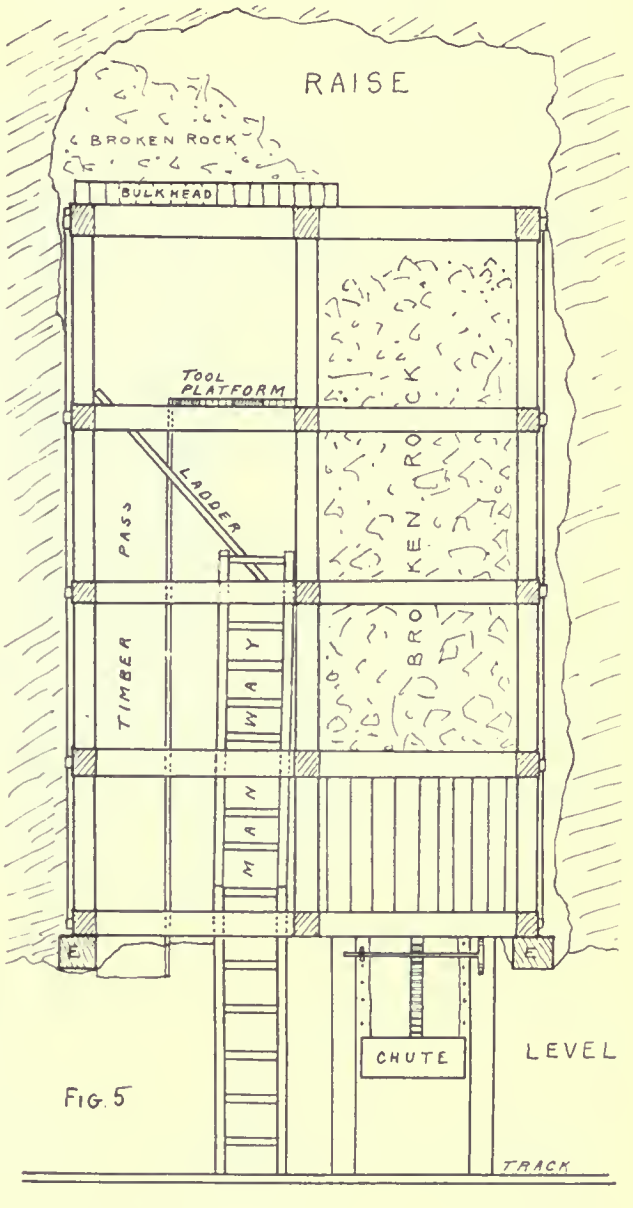


FIG. 5

every third set 22 in. wide and 36 in. long. The ladders should be placed on the platforms and 8 in. from the wall-plates, and should extend at least 12 in. above the set at the upper end. It is also a good idea to provide a substantial hand-hold 12 in. above the top of each ladder, as an aid to men who may be carrying tools or other things up or down the raise. An iron staple 8 in. wide, driven into the lagging at the side of the shaft, or a piece of 2 by 4 in. scantling spiked to cleats at a convenient place may be used.

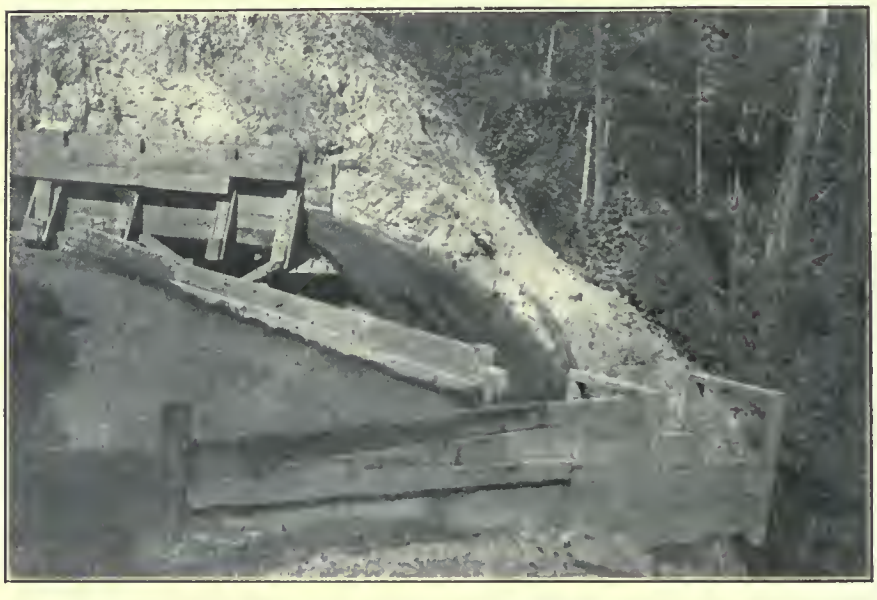
The ladders should be set one above another, and always inclined in the same direction, so that a man, having reached the top of the ladder, steps to one side upon the plank platform and back to the foot of the next ladder, continuing the ascent. This arrangement leaves

an open space at one end of the shaft 14 in. by 5 ft. To expedite the hoisting of timbers, machines, and other things up to the working place, a portion of this open space should be boxed-in on four sides. This chute may be constructed of 2-in. plank, and, if it be made tight, it will greatly aid ventilation—a most important matter, when raising, under any conditions.

Having described the method of placing ladders, platforms, etc., we may now resume mining operations. Assuming that we have cut our raise to a height of 12 ft. above the bearers, and that we have placed a complete set in position, put a short ladder reaching from the first platform to the top of the last set, and over the man-way compartment construct a bulkhead of 8 by 8 in. timbers, leaving the rock-compartment uncovered. Spike lagging vertically on the four sides of the rock-compartment (inside). Drill a full round of holes in the back of the raise. These holes should be loaded as lightly as possible, just sufficient to break down the rock. When ready to fire, remove two or three of the timbers of the bulkhead, in order to go down through the man-way. The machine-drill and other tools may be placed on a platform built on the set beneath; the holes over the manway side are then 'spit'; the timbers of the bulkhead are replaced, the men retiring to a safe distance in the adit. When the smoke has cleared, after blasting, the miners return to the raise and, removing some of the lagging leading to the rock-compartment, pass through and climb upon the bulkhead. After barring down all the loose rock possible, they clear the bulkhead of rock, care being taken that no rocks too large to pass the chute-door below are allowed to go down into the bin. The holes over the rock-compartment are then loaded and fired, the men going below through a hole in the bulkhead and pulling the timbers back into place as before. By shooting the back out in two rounds, in this manner, the chute can be protected to a great extent, and little, if any, damage results to the timbers. Again the miners return, passing through a hole in the lagging which is made secure before blasting again. The loose rock is once more barred down, and all rock on the bulkhead is shoveled into the rock-compartment. If the holes have broken well there will probably be more rock than can be accommodated by the ore-bin and the single set of the shaft above it. In this case the men could not return to their work before drawing off several cars of rock at the chute, and it may be necessary to do this after the first round is fired. Never draw more than necessary to get through the lagging from the man-way into the rock-compartment. Throughout the entire operation of cutting this raise, the rock-compartment must never be drawn off lower than four feet from the top of the uppermost set, and leaving as much more rock as possible.

When sufficient headway has been made, another set of timbers is placed in position and the bulkhead is moved up one set, and also the temporary platform upon which are placed the tools when ready to blast. When four sets are in position the first permanent ladder may be put in place, and the construction of the box-chute commenced. After each full round, the rock broken down usually fills the rock-compartment and covers the bulkhead. If the fuses of the holes over the bulkhead are cut so as to cause those holes to go first, the broken rock will afford some protection to the shaft-timbers, but after each round some rock must be drawn from the chute in order to permit the men to return to their work at the top of the raise. The work proceeds in the manner described, the timber sets being placed as fast as room can be made for them. Timbers can only be lined up by the use of a spirit level. In shaft-sinking four plumb-lines are generally used, but that is not practicable in this case. By exercise of care the sets may be kept well in line by using a long leveling instrument such as a carpenter or machinist employs.

The question of ventilation is all-important, but may usually be satisfactorily solved by carrying a pipe close up to the bulkhead, or the timber-chute in the man-way may be used for this purpose. If a machine-drill is employed, the exhaust from it will aid ventilation materially. If the air-tight box be built in the man-way compartment as previously suggested, good ventilation may be facilitated by turning a jet of compressed air into the bottom of the box. This will induce a strong upward current in the box and a corresponding downward current in the open compartment.



Under-Currents at the End of Sluice-Boxes.

THE discoveries of science are made by steps which are perfectly simple to those trained to follow them. No discovery is made by chance in our day. None come to contradict existing laws or to discredit existing knowledge. The whole of no phenomenon is known to man. The whole truth never can be. Ultimate truth was never in any man's possession. The unknown surrounds on all sides all knowledge in man's possession. The beginning, the end, and the ramifications are beyond his reach. He was not present when the foundations of the universe were laid. He may not be present when they are destroyed. But scientific knowledge, though limited, is practical and positive so far as it goes. It rests on experiment and observation alone. Every step in observation, experiment, or induction has been tested by thousands of bright minds. He is already a master in science who can suggest even one new experiment. There is nothing occult or uncanny in scientific methods. The 'magic wand' which creates new species of horses or cattle lies in the hand of any stock breeder. The magic key of the electrician by which the foam of the cataract becomes the light of the city may be held by any municipal council.

Loss of Gold in Placer Mining.

Written for the MINING AND SCIENTIFIC PRESS
By DENNIS H. STOVALL.

In the placer fields of northern California and southern Oregon every effort is made to make mining methods efficient. Iron and wood has been replaced by steel, ditches have been widened and deepened, reservoirs enlarged and set on higher ground, and the head of water employed has been raised from 200 or 250 ft. (which was the heaviest possible with an old-time equipment) to 450 and even 520 ft. A giant working under such tremendous pressure as this, maintains a cutting power at a distance of 400 ft. from the foot of the gravel bank. In the Royal Group hydraulic mine in southern Oregon, two giants operating under a head of 510 ft. hurl their streams 500 ft., biting off the gravel in slabs of a thousand tons. But the manager of the Royal Group, like other placer managers on the Pacific Coast, is discovering the important truth that the entire attention of the placer miner must not be confined to moving of the gravel, to the neglect of gold saving.

Monitor at Work on the Royal Group Hydraulic Mine.

The sluices and riffles are not catching the gold, and in a great majority of the mines they are saving none of the platinum. Since the bedrock race affords the best possible riffle for catching and saving the gold, the placer miner will find it to his advantage to make this race as long as possible, or at least of ample length, before discharging the water and flowing gravel into the sluices. The sluices must be provided with more efficient riffles.

Sluice-boxes, in their general arrangement, are but little different today from what they were fifty years ago; except that now a sort of standard is adopted. A sluice-box, in placer mining parlance, means a 12-ft. section of the entire sluice. These sections are interchangeable, each box being an independent piece and made to fit, end to end, with its neighbor. This not only facilitates cleaning up, but the sluice-ways can be more readily and easily shifted about, especially where the dumping ground is not deep, and a new dump must be made at intervals during the season.

So, after all, the sluice-box itself is not a gold-saver, it is merely the receptacle that holds the riffle, and through which the auriferous stuff flows. And the problem therefore is to make the present riffle more efficient, or replace it with a better one. Experienced placer miners state that the 'non-boiling' riffle is the best for saving gold. The old idea that a riffle must offer 'resistance' to the gold, is not sound. Repeated practical tests and actual experience has taught a few, and will teach others in the course of time, that the riffle that saves the greatest percentage is the riffle that offers the least resistance, but which allows the gold and the platinum sand ample chance to settle.

The common block riffle, which is generally used, possibly because it is the most convenient to make, is a 'boiling' riffle of the worst kind. It consists of five or six-inch blocks sawed, squared, and set in pairs on the sluice floor. The blocks are cut and set with the lower side higher than the upper, to increase agitation and 'resistance,' and a crevice two inches wide and the depth of the block is the receptacle in which the gold and black sand lodge. About one-half the gold and all the platinum, kept constantly on the surface of the current by the agitation of the water, fails to settle and flows over the dump. Only the heavier nuggets and pieces drop into the crevices between the blocks.

Pole riffles are made of four-inch poles laid side by side the whole length of the sluice floor, which can be lifted out at clean-up, just as is done with block riffles. Pole riffles have been found to be more efficient than blocks, simply because they are laid lengthwise and do not 'boil' the water.

A durable and efficient riffle that is used by some of the bigger mines of Oregon and California, is made of railroad rails, placed bottom-side up, tilted just a little, and set an inch or more apart on the sluice floor. The sluice current flows smoothly over this riffle, giving the

gold ample opportunity to settle into the crevices between the rails. While such riffles will practically wear for all time, they are a difficult thing to secure, and are heavy to handle.

A riffle that has the efficiency of the railroad iron, but is cheaper and more easily handled, is made by setting 2 by 4 in. scantlings edgewise on the sluice floor, and two inches apart. Slightly bevel the top edge and bolt strap iron on it, the straps being a half inch wider than the scantling. This riffle does not produce agitation, and the gold and platinum sand settle in the crevices between the scantling. Riffles of this sort, cleated together, and made of a width and length to fit each sluice section, can be readily set into the boxes, and as readily lifted and rinsed when the time comes to clean up.

The fine 'flour' gold, as the miners call it, is elusive stuff, and most difficult to save. At the Royal Group mines, undercurrents are used to catch and save this 'flour gold.' Near the end of the sluiceway, and as close to the dump as possible, about one-fourth or one-third of the water is drawn down through an open grizzly on the sluice floor. This water is nearest the bottom and in it are nearly all the fine particles of 'flour' gold. It is spread out over a set of broad riffle-tables where the fine gold and sand settle. These riffle-tables are covered with burlap or some such material, to arrest the gold; they are easily lifted and rinsed in vats of water, where the values settle and are later saved by scooping up and carefully panning over still water.

The more careful placer miners are learning that much fine gold and platinum are lost by the time-honored custom of cleaning up and panning in the running water of the sluice. When clean-up time arrives, the riffles are lifted and carefully rinsed. The sand, containing gold and platinum, is scooped up and panned over vats of still water, instead of allowing a steady stream to flow through the sluice for this purpose. The first panning is for the gold, letting the black sand and platinum particles, which are lighter, boil over and settle in the vat. This sand is taken up later and panned separately. While this method is more tedious than the old way, it results in a far greater saving.

TRANSVAAL OUTPUT.—We take from the *Transvaal Leader* the following data: During the year 1906 the Transvaal produced gold to the value of £24,516,704, as against £20,860,141 in 1905. The number of stamps dropping returned at the end of November was 8,350, of which 8,005 were on the Rand, comparing with 5,835 stamps at the end of 1905. The dividends declared for the year 1906 by Rand gold companies amount to £5,565,970, against £4,754,348 in 1905. Of the total distribution the mines employing Chinese only for unskilled labor paid in dividends £1,099,450; and allowing a proportion due to the labor of the Chinese on the Geldenhuis Deep, New Heriot, Nourse Mines, and Rose Deep, which are worked partly by Chinese and partly by Kaffirs, Chinese labor may be said to have contributed £1,367,210 of the dividends declared in 1906. The nominal capital of the companies that paid dividends is £23,131,284, on which the return shown is about 24%. The profit distributed is estimated at 23.67% of the production, as against 23.9% in 1905; or, put another way, the profit distributed amounted to 4s. 9d. out of every 20s. of gold produced, against 4s. 9¼d. last year. The total profit of the dividend-paying companies is estimated at £8,150,000 for the year, out of which the amount declared in dividends comes to 70%, the remainder being accounted for by profits tax (equal to 5d. out of every sovereign produced, or 7½ to 8% of the profit), special reserves, debenture interest, renewals, and so forth.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The possession of the surface of a mining claim is the possession of a vein or lode having its apex within the surface lines of the claim, although extending downward, such vein may pass within the vertical side lines of the claim, and will support an action of trespass for the removal of ore from such vein beneath the surface of an adjoining claim.

Montana Mining Co. *v.* St. Louis Mining, etc., Co., 147 Fed. 897.

A lease of a mine for railroads provided that the lessee should work and develop the premises in a mine-like fashion, and in a manner conformable to good and economical mining, and so as to take out the greatest amount of ore possible and to do a certain amount of work each month; it was further provided that a failure to do so would be a violation of the covenants of the lease. Under such a lease it was not optional whether the lessor would comply with the requirements as to working and developing the mine, and that his failure to comply merely entitled the lessor to forfeit the lease; but on the contrary it imposed on the lessee the obligation to work the mine in the manner specified or to respond in damages for failure so to do. The amount of recovery under such a lease would depend on the amount of ore that could have been mined if any reasonable diligence had been exercised.

Macon *v.* Trowbridge, (Colo.) 87 Pac. 1,147.

The location of a mining claim has the effect to segregate such land from the public domain, and until some act or laches of the locator occur by which the title reverts to the Government, there can be no re-location.

Slothower *v.* Hunter, (Wyo.) 88 Pac. 36.

A statute provided that a certificate of a mining location should contain a description of the claim by such designation of natural and fixed objects as should identify the claim. Under this statute a certificate was held *prima facie* sufficient which described the location in a designated mining district and county and further described the claim as lying west of other designated claims. The failure to give distances and directions did not affect its validity. It was further held that the failure to recover the certificate within sixty days did not render it invalid; the effect of such failure being that it might affect intervening rights.

Slothower *v.* Hunter, (Wyo.) 88 Pac. 36.

A lessee of a mining claim who has contracted to do an amount of work thereon which would be a sufficient compliance with the legal requirements in respect of development, and also to notify the lessor of any intention to surrrender or abandon the lease, cannot on failing to perform his obligations secretly re-locate the claim, and so secure and hold the title for himself. A patent obtained under such circumstances was decreed to be held in trust for the lessor.

Stewart *v.* Westlake, 148 Fed. 349.

The statute provides that within 90 days after the posting of a notice of a mine claim, the locator must sink a shaft on the claim to a depth of 10 ft. from the lowest part of the rim of the shaft at the surface, or deeper, if necessary to show a well defined crevice or deposit; or in lieu of this he shall make a cut, cross-cut, or tunnel which cuts a lode at a depth of 10 ft. below the surface or an open-cut of at least 10 ft. in length along the lode from the point where the lode may be in any manner discovered. Neither of these requirements were satisfied by a declaration which merely stated that the locator within the 90 days dug "a tunnel at the point of discovery of the following dimensions: About 12 ft. long, 6 by 4½ ft. cut 3 ft. deep, 6 ft. wide, wherein is disclosed a well defined crevice and valuable deposit of ore." The declaratory statement was defective in not showing that vein or lode was not cut at the depth of 10 ft. below the surface.

Dolan *v.* Passmore, (Mont.) 85 Pac. 1,034.

Mining in Nevada.

By CHARLES G. YALE.

*Nevada is at present attracting more attention from the mining and speculative public than any other mining State in the West. This interest is largely based on prospective values, but there is no doubt that some of the mines already productive are making such a showing as to give confidence both in themselves and in others still in course of development in the same camps. Moreover, while the present excitement has been brought about by the developments in the newer camps of southern Nevada, it is also true that many of the older camps known for thirty or forty years have again become the seats of great activity.

After the working out of the great and famous bonanzas of the Consolidated California & Virginia mine on the Comstock and the failure for many years to find new orebodies of value in any of the mines in that extensive lode, the mining public turned its attention elsewhere. As a result Nevada became neglected. It became difficult to obtain capital for investment in any of the mining districts, no matter what prospective showing was made. The annual bullion production of the State continued to decrease until it became a small amount as compared with the output in the palmy days of the Comstock lode.

The revival of interest in the mining industry of the State may be said to date from the discovery of ore at Tonopah about five years ago. As developments progressed at Tonopah it became apparent that the camp bid fair to become as permanent as old Virginia City itself. It has taken strenuous development work and large investment to bring Tonopah to its present position, but during the progress of this work the swarms of prospectors and miners attracted there spread over the adjoining region and discovered several other camps, some of them already overshadowing Tonopah itself in point of productiveness.

As one after another of these new districts were discovered and rich bodies of ore were found the mining world began to realize the great importance of the region under development. Both miners and investing capitalists saw opportunities for enriching themselves. An abundance of money was forthcoming for any mining venture. Miners obtained grubstakes with ease, secured valuable leases, were enabled to sell their best ore for cash as soon as it was brought to the surface, or could sell their claims outright for good prices if they so desired. It was possible also to obtain the money at once for equipment and development of any claim making any sort of showing. Under these conditions, not always prevailing in new districts, it is small wonder that remarkable and rapid development has taken place throughout southern Nevada. Moreover, the claims themselves merited the work done upon them as has been shown by the financial results, the most potent factor in the success which has followed the opening of the districts referred to.

The building of new railroads across Nevada had already been projected when these mines were discovered, but the mining developments have caused much more rapid construction of these roads and also the building from main lines of others designed to furnish transportation for the more important camps. Only the richest of the ore could bear transportation where long wagon hauls were necessary to reach the railroad lines, but it is a matter of astonishment that such large quantities of ore were shipped under the circumstances. The nearest smelting works—hundreds of miles away—became overcrowded with ore from the new mines, and thousands of tons of second-grade ores have been piled on the dumps waiting for cheaper transportation or local reduction works.

It seems odd now, in view of subsequent development, that the first of the new camps, Tonopah, was held back a year or more by the lack of faith in the mines on the part of the companies which had bought the more prominent claims. Instead of proceeding on their own account, they adopted the leasing system, thus avoiding further investment and letting the lessees themselves prove the value of the claims. This they did, however, in short order, not only making fortunes for themselves, but making great mines out of mere prospects, to the benefit of the more timid companies.

It may be confessed that to the leasing system is largely due the magnificent developments which have been made in many of the mines of the new camps. Some few of the companies have, of course, done their own work, but the lessees have really performed most of it. Some of these leases have resulted in the output of millions of dollars. Most of them expire early in 1907.

There is a wide area of the southern desert section of Nevada over which prospecting operations are now being conducted, and this mineral belt has been found to continue over into Inyo county within the California boundary.

This review of the conditions existing in Nevada, accompanied by the statistics for 1905, refers only to that year, but it may not be out of place to write briefly of some features relating to a subsequent date, as they have been largely influential in bringing about the present widespread interest in the mining affairs of the State. The most important development in any single mine has been that which has occurred in the Mohawk mine, at Goldfield, where the richness and quantity of the ores obtained by the lessees during 1906 have arrested the attention of the mining world. From published reports concerning the leases in this mine (not verified by the United States Geological Survey) it appears that from April 18 to November 20, 1906, the gross value of the ores shipped by the various lessees in this mine amounted to $4,075,919, and the net values to $3,135,426. They also had ore stored and in transit amounting in value to $950,000 additional. It was estimated also that over $1,000,000 would be recovered during the remainder of the life of the leases, which expire in January, 1907. On November 20, 1906, the Mohawk merger took place, by which the Goldfield Consolidated Mines Company acquired the Mohawk, the Red Top, the Jumbo, and the Laguna properties, and they will be hereafter worked as one. The company has been organized with 5,000,000 shares of capital stock, par value $10 per share. Before the consolidation these separate properties had produced a total gross sum of $6,054,610. The Mohawk did not produce until 1906; the Jumbo began producing in July, 1904. The Red Top ore has been reduced in a small local mill operated under lease.

The average freight and treatment rate on ores shipped to smelters for 1906 has been $23.50 per ton. The cost of treatment of oxidized ores in the Combination Mines Co. mill for the same period has been $5.82 per ton, with about 91% extraction. This cost will be further reduced by a mill treating a large tonnage, and this mill has now been constructed. The mines are well developed considering the short time which has been occupied in the work. Under the leasing system, although the ore was exceptionally rich and the life of the lease short, there has doubtless been much robbing of the mine, which will not be the case when systematic development work is conducted by the company itself.

*Abstracted from "The Production of Gold and Silver in 1905." By Waldemar Lindgren and others. U. S. Geological Survey.

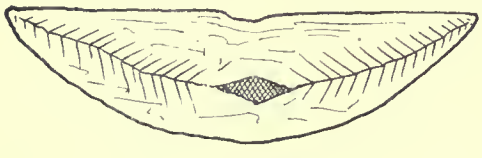
Silver-Lead Smelting Practice.

By T. S. AUSTIN.

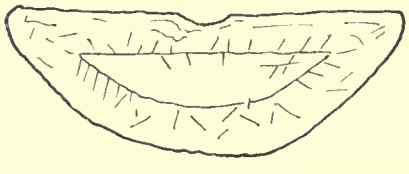
Edited for the MINING AND SCIENTIFIC PRESS by L. S. AUSTIN.*

SLAG COMPOSITION AND CHARACTERISTICS.—[In a letter written in June, 1883, he goes into the subject of the physical appearances indicating a good half-slag. It will be noted that formerly the metallurgist, before altering his charge for its improvement, went by these indications, while today he depends largely upon the results obtained from chemical determinations. The remarks are as follows:]

About half-slags (of the type $SiO_2 = 30$, $FeO = 40$, and $CaO = 20$ per cent).—The appearance in the pot is generally that of more or less concentric rings and radiated lines across the rings from the centre. A good pot generally quarters, that is, it divides on the surface into quarters when nearly full. It must show a slight drip, or even a decided one, if over acid. If it has an excess of lime and is yet acid enough, it will not show the feather. The comb or spout should be 6 to 10 in. long. The hand-sample (taken in a hand-ladle), and the big pots will show large crystals; the more iron the larger the crystals. Lime gives a granular structure in the pots and hand-sample, though I prefer to have lime slightly



Acid-limy slag.



Acid slag

in excess, provided the slag is acid. A good half-slag has, in the hand-sample, the crystalline structure clear to the edge, as also in the big pots, thus:

Should you have a structure where the lines do not run up to the edge and where the corner has a sort of an unfinished look with a reddish tinge, it is apt to be acid thus: If the cavities do not show well-defined crystals, but are smooth and hard-looking, it shows almost invariably too much iron for the silica. The big pots, when smooth on top, show an excess of lime.

Finally, the best slag is the one that is the cleanest, and which keeps the furnace open. There is no royal road to slags any more than to learning; they must be studied out. The first thing is to get a slag acid enough, and then you can work out the relation of iron to lime.

FURNACE OPERATIONS AT THE RIO GRANDE SMELTING WORKS, 1892.—[In regard to the general technical operation of these works, he advised according to methods applicable today, treating the subject in detail as follows:]

Slags: I have pretty generally adopted the three-quarter as the working slag. It is more economical of iron than the half-slag, and, I think, keeps the furnace in good shape just as well. For Salt Lake conditions you may figure it at 33% SiO_2, 33% FeO and MnO, and 23% CaO. This will, for those constituents, add up to 89%. BaO and MgO, when you have them, are substituted for CaO inversely in the ratio of their atomic weight.

For my particular conditions, however, I run a modified three-quarter slag. I figure SiO_2 and FeO as being equal, add the RO bases (ZnO and Al_2O_3 chiefly), and make up to 100% with CaO. The three constituents SiO_2, Fe, and CaO then commonly add up to 83%. If I take SiO_2 and FeO at 66%, there remains 17% for the CaO. This slag has the main physical characters of the three-quarter type. Now, Raht would call this a half-slag, the CaO being half the FeO, but I think my theory, that it belongs in the three-quarter family, is the correct one, because of the SiO_2 and FeO ratios, and because I deduced the slag composition from the three-quarter basis. Raht, at Pueblo, runs a slag of high silica, say 33 to 35%, and then figures his lime to one-half or a little more of the FeO present. Of course, he thus neglects the other bases, namely, MgO, BaO, Al_2O_3, and ZnO, which his ores likewise contain. He gets to about the same place as I do, because his neglected bases are about the same as mine. Now, it might be possible for you to figure an acid half-slag and reach the same point that he does. If you can get more silica on the charge, it will pay you better, provided you do not have to increase iron and lime. I would be very careful about it, but still would try to work up to it. Of course high-silica slags contain more silver than the more basic ones, other things being equal. I mean, that with high silica, you must use more fuel and run slower, but you get so much nicer crucible work.

While the slag type is to be worked out for each locality, I may say that certain general rules obtain everywhere, thus: High-silica slags give high silver unless run slowly, and, even then, are not sure to give good results. They are so viscid when very silicious, and mechanically carry so much matte, that I deprecate their use under any conditions. Medium-silica slags are less objectionable, and give good furnace work. Low silica gives better general work.

In the half-slag, I define these thus: Low silica, 30%; medium silica, 32 to 33%; and high, 33% upward.

Silicious or infusible slags of any kind are apt to induce a hot top, and, for this reason, I object to the one-to-one type, which is very infusible when in its acid form. It also runs slowly. As regards the value carried off in the slag, observe that when it approaches an irony-acid character in any type, the silver will run higher than normal. Of course, this kind of a slag runs nicer, as far as furnace working is concerned, but you will have to count on larger losses. Copper acts strongly to remove the silver from slags, and, whenever you have matte in large quantity on the charge (and good in copper grade), you may look for materially lower silver assays of the slag. To offset this you have those crucible troubles that copper always engenders.

Zinc: I find 3 to 5% in my slags (at Socorro, N. M.) and the lime on those slags is always low when the zinc occurs in form of ZnO. I figure half the zinc on the charge and make that the amount of the replacing lime. Here are some analyses:

	FeO + MnO	SiO_2	CaO	ZnO	
I	32.1	32.0	21.5	4.8	Ladle sample
II	35.0	32.3	20.1	5.0	" "
III	31.0	33.2	22.2	3.0	Crystals
IV	33.9	33.2	21.0	3.0	Ladle sample
V	36.2	34.0	17.8	5.5	" "
VI	34.8	31.7	19.8	4.2	" "

It will be seen that in these the lime and zinc oxide about make up the right amount of the 'lime base,' that is, 24 to 26%. Sometimes the FeO runs over 34% and the silica is often lower than 33%, but you will observe

*These observations of T. S. Austin, recently deceased, general superintendent of the Southern Department of the American Smelting & Refining Co., are compiled from letters written by him to his brother, from 1883 to 1906, covering most of the period of his wide experience in silver-lead smelting, and to some extent that in base-bullion refining. They lack some of his recent experiences, but show that much of his knowledge had been brought into finished form some time before his death. The notes refer largely to his work at Socorro, New Mexico, Monterey and Chihuahua, Mexico, and to El Paso, Texas, together with other technical observations made during that time. Professor L. S. Austin's remarks are in brackets.

that they are pretty close to the figured amounts, respectively (FeO = 34 and SiO_2 = 33%). I find I am compelled to get a lower lime than 24%, in order to get good work. [He does not, however, bother about variations in alumina when it is in moderate quantity.] After all, general appearance is the guide in furnace running, and, if you can get some types of crystals and surface characteristics, you will be all right. [He notes that lately he has found a peculiar thing, namely, that the slag crystals were much higher in silver than the main bulk of the slag—something contrary to all his former experience.]

[Regarding the use of a basic slag, where zinc (especially in oxidized form) is present, he remarks:] The difficulty with such low silica is that you crowd silicious ore off the charge and smelt the more expensive flux. The little saving in lead (by running the more basic slag) does not begin to compensate for the commercial losses of less silver ore, more flux, and more coke relatively to the ore-tonnage. The labor, per ton of ore, is also increased, and the furnace does not keep in as good a condition in the crucible. Imagine the effect of reducing silica to 30% and increasing FeO and CaO by 6%. It means adding nearly 20% inert matter to your charge and paying for smelting it, that is, increasing the cost of smelting 20%. When at the Grant works (where a low silicious slag is used), I noticed them cutting out an ugly crucible-crust, due to over-reduction (0.2% Pb in the slag). This low percentage does not indicate a good slag, but rather the use of too much fuel. I do not understand that their furnaces have a large tonnage, and the cleanness of their slags may be due to slow running induced by excessive fuel. I doubt if they have grasped the theory of blast-furnace reactions as Raht has, simply because they do not handle their furnaces on the same lines. His results are obtained by running on the "ragged edge" of reduction, and he gets large tonnage, furnaces in splendid condition, long campaigns, and good metallurgical work by being "onto the fuel racket." I work on the same lines, and no one can make me believe that it is good metallurgy to use so much fuel as to practically clean the slag from lead.

Alumina: In regard to alumina, I would try treating it as a base. I have never had any experience with it myself, but, though there is a theory extant that it sometimes acts as an acid, I do not know of any proof positive, except one trial by Schneider in a little furnace, that it does take that part.* James, at the Germania (1888), has had experience with it, and tells me that it acts as a base as far as he knows. I also know that it has been run here at the Graphic works, taking the place of lime. I would not lower either silica or iron unless the slag showed very acid, and then of course the silica. I would figure the lime in ratio of its equivalence to alumina (CaO, 56; Al_2O_3, 103), or one pound of lime as equal to two pounds of alumina. Therefore, if you calculate for 23% CaO, and it comes down 18%, there is 5% displaced by 10% Al_2O_3. Of course, the silica and the iron will be lowered at the same time, and you will have a basic slag. You need not be afraid of any moderately acid slag, and an excessively acid one even, will not do much harm, as it can be quickly corrected by eye. See to it that your trouble does not come from some mechanical cause, such as insufficient blast or some other irregularity. Subjoined are the analyses of two copper-furnace slags:

I.		II.	
SiO_2	26.64%	SiO_2	34.31%
FeO	42.60	FeO	32.27
ZnO	0.62	MnO	6.24
CaO	9.51	CaO	10.13
Al_2O_3	15.40	MgO	2.30
		Al_2O_3	11.80
	94.77		97.08

*Trans., A. I. M. E., Vol. XI, p. 56.

We have here two extremes, but the amount of iron with the less silica is the larger. Of course, that approximating No. II would be the one for our use, making the FeO and MnO less, and the CaO more.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The samples from Diamond Springs, Cal., marked H. S., are impure Clay containing much Iron and Manganese. There is nothing of value in the material.

The specimens from Concord, Cal., marked S. A. S., are nodules of Clay and Shale. A thin layer of Calcite has been deposited as a coating on some of the pieces.

C. A. P., of National City, Cal., sends black sand composed mostly of Magnetite grains, but also having Ilmenite, Chromite, Quartz, Garnet, Zircon, and Chrysolite intermixed.

The rocks from Hornitos, Cal., marked J. B. F., are: No. 1, white Quartz containing fine granular Galena and a small amount of Sphalerite; No. 2, Quartz with Chalcopyrite, Galena, and Sphalerite.

The specimen sent by C. S. McM., of Iron Springs, Idaho, are all metamorphosed rocks. No. 1 has schistose structure and contains green chlorite stains; No. 2, Quartz; No. 3 is Feldspar and Quartz; No. 4, a chloritic rock containing many small cubes of Pyrite.

The ores from E. A. C., Goldfield, show bronze-colored Bornite and streaks of a dark gray metallic mineral, which gives reactions for copper, iron, silver, antimony, and sulphur. No tellurium reaction was obtained. The mineral is a Sulph-antimonite, probably an iron-rich Tetrahedrite. The green coating also gives no reaction for tellurium, but shows chlorine, iron, copper, and silver. It may be a chloride, but the amount of material was insufficient to determine definitely its nature.

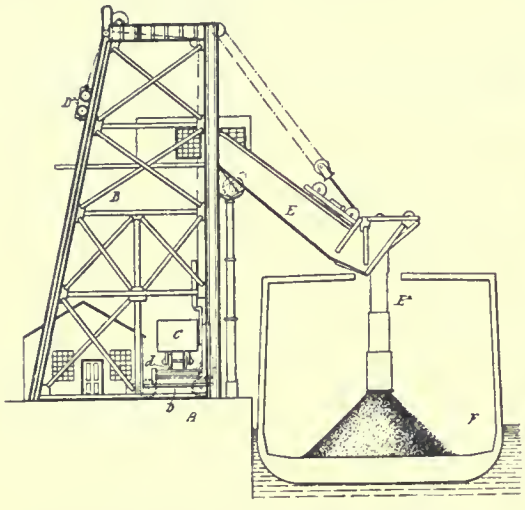
IN THE first half of the last century England was possessed with a Spanish mining fever, which led to the launching of all sorts of enterprises to exploit the mineral wealth of old Spain, of Mexico, and of South America. The fever for Mexican mining did not abate until leeches had been applied to the extent of about fifty million dollars. Failures were made with mines which today are doing well; and the difference in result is not all in the greater experience or added knowledge of the present day, it is due to the avoidance of an extravagance which in the former era took the special form of bringing a staff and even workmen from England, people who knew neither the country nor the ways of it, and delighted in importing the most ponderous kind of machinery and the greatest variety of supplies at ruinous rates of transport.

THE decided rise in the price of antimony is probably due to the increased demand for it in the machine industries, to the partial replacement of tin (which is now scarce and expensive), in babbitt and bearing metal, to the poverty of the deposits as they are opened up to greater depth, and to the relatively increased price of all metals as compared to the constant price of gold. There is a growing demand for it as a pigment, because it has the advantage over white lead of being innocuous, and over zinc paint, of being permanent and sun-proof.

MINING AND METALLURGICAL PATENTS.

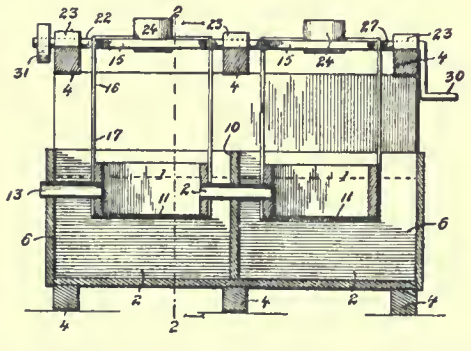
Specially Reported for the MINING AND SCIENTIFIC PRESS.

SCREEN FOR CAR-DUMPING APPARATUS.—No. 843,334; Charles A. Fry, New York, N. Y., assignor, by mesne assignments, to Dodge Coal Storage Company, Saugatuck, Conn., a Corporation of Connecticut.



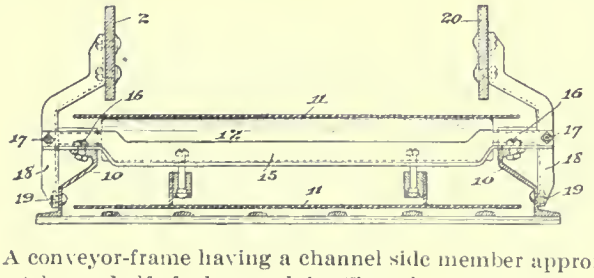
The combination in a car-dumping apparatus, of a structure, a platform for carrying the car, means for dumping the platform and the car, a chute at one side of the structure into which the material is discharged from the car, a screen at the inner end of the chute, a trough under the screen, a conveyor in the trough, a telescopic tube connecting with the trough, a screenings-hopper, and a conveyor leading from the outlet end of the telescopic tube to the screenings-hopper.

ORE-SEPARATOR.—No. 843,086; Lucian B. Hunter, Greeley, Colorado.



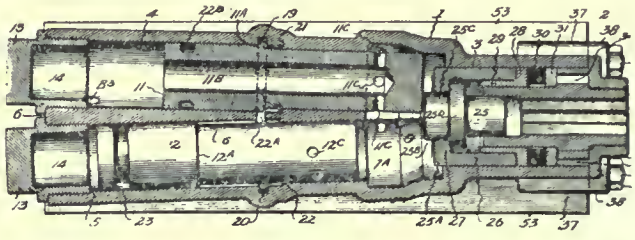
In an ore-separator, the combination, of a plurality of tanks, a jig-box in each tank, flexible conductors connecting the jig-boxes, levers having one end slotted and the other end forked to form arms, pivot-shafts passing through the arms, hangers pivoted to the ends of the arms, the jig-boxes secured between the lower ends of the hangers and depending into the tanks, counterbalance-weights having intersecting slots to engage and rest on the forked portions of the levers, and means for oscillating the levers.

CONVEYOR.—No. 842,900; William H. Morenus, Lake View, Iowa, and Frank R. Jones, Harvey, Ill., assignors to Austin Manufacturing Company, Chicago, Ill., a Corporation of Illinois.



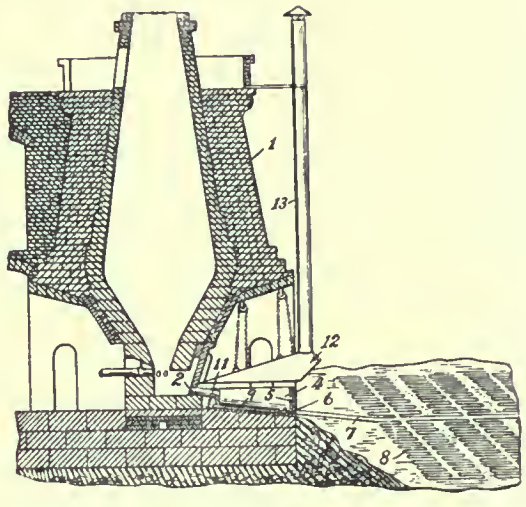
A conveyor-frame having a channel side member approximately one-half of whose web is offset, the exterior surfaces of the channel's flanges being parallel. The combination of a frame, the side members of which are channels, the upper parts of which are inwardly offset and the flanges of which project outwardly with their exterior surfaces parallel, suitably-mounted rollers, and an endless conveyor-belt, said belt being of sufficient width whereby its longitudinal edges lie above and below the offset webs of said side channels.

MULTIPLE-HAMMER-PISTON ROCK-DRILLING ENGINE.—No. 843,159; John G. Leyner, Denver, Colorado



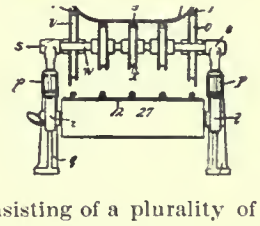
A rock-drilling engine, comprising a casing containing two cylinders arranged at an acute angle to each other, a hammer-piston in each of said cylinders, means to secure a drill in the front end of said casing and means to reciprocate said hammer-pistons to deliver alternate blows upon said drill.

TREATMENT OF IRON AND STEEL.—No. 843,569; Harry Luckenbach, San Francisco, Cal., assignor of part interest to William H. Kelly, San Francisco, Cal., George L. Robinson, Frederick E. Fishel, and Joseph J. Robinson, New York, N. Y., and Frederick F. Nolte.



The process of purifying iron which consists in generating steam, superheating the steam, passing the superheated steam into the bottom of a vessel adapted to contain molten iron until the issuing steam is entirely free from moisture, then tapping the molten iron into said vessel from the blast-furnace, and continuing the injection of the superheated steam into the molten iron while at rest in said vessel.

CONVEYOR.—No. 843,018; James A. Jamieson, Montreal, Quebec, Canada.



A conveyor consisting of a plurality of traveling flexible lengths and a flexible apron resting loosely thereon and the flexible lengths supporting the apron in the form of a trough, a conveyor consisting of a plurality of series of sheaves, the sheaves of each series being arranged in tandem relation to the sheaves of the other series, a flexible length supported by each tandem series of sheaves and an endless apron looped over and resting loosely upon and supported in the form of a trough by such flexible lengths.

Henry C. Sergeant.

Henry Clark Sergeant, of the Ingersoll-Sergeant Drill Co.—now an integral part of the Ingersoll-Rand Co.—died at his home, Westfield, N. J., January 30, at the age of seventy-two years.

Mr. Sergeant won a world-wide repute as a facile, prolific, and highly successful inventor, especially in the design of rock-drills, air-compressors, and mining and excavating machinery in general, his active life having been coincident with the period of development of the modern apparatus now so universally employed and so industrially efficient, he having been a leading and active agent not only in the invention and improvement of machinery but also in the devising of the details and the means of precise and economical manufacture. He was born at Rochester, N. Y., but his earlier years were spent in Ohio. He was of untiring activity, both physical and mental, from the beginning. He had only a common-school education and was working in the machine-shop at a very early age. His irrepressible inventive faculty made work for itself from the first. He quickly began to see the undeveloped possibilities of systematic manufacture by the aid of special machinery. His first practical application of his theories was to the making of spokes, hubs, and felloes of wagon wheels. He designed special machines for this work and at the age of eighteen he accepted a contract for manufacturing wheel parts in quantity. In this he was so successful that in two years he was taken into partnership by a firm manufacturing wagon wheels.

The routine of the factory, however, could not hold him, and after severing this first business connection the next six years of his life were spent in various pursuits, chiefly commercial, in which he met with varying success. He was a ready speaker, though not known as such in later years, and found favor as a lecturer. He had figured for a time also as a champion skater. He still found time and opportunity for the invention and development of labor-saving machinery.

Mr. Sergeant's first patent, issued when he was nineteen, was for a boiler feed. Succeeding patents suggest the range of his inventive faculty. In December, 1858, he patented a steam-engine governor. This was a governor for marine engines to prevent their racing to destruction when the wheels were out of the water. This was adopted by the Government and applied to the warships of the period. After that he secured patents for gas-regulators, for steam-pumps, four for steam-boilers, five for brick-machines, a fluting-machine, six for water-meters, and all these were invented before he had struck what must now be considered his life work.

Three of the brick-machine patents were issued in 1867 when he was a resident of Columbus, Ohio, but soon after that he started a machine-shop of his own in New York, developing many crude ideas into practical working successes. In the early '70s hither came Simon Ingersoll with the drawings for the first Ingersoll rock-drill, a then untried device. The possibilities of the rock-drill attracted Sergeant. None can say now how much he contributed to the development and success of the original Ingersoll drill, but at least one patent was issued to Ingersoll and Sergeant as joint inventors. The Ingersoll Drill Co. was formed and placed the drill on the market.

Although the drill was at first operated by steam, its advantages when driven by compressed air and the absolute necessity of using air for mine and tunnel work, turned Sergeant's attention to the improving of the design and details of the air-compressors, which the Ingersoll Company began to market in connection with the drills and for other incidental uses. He was soon working with all his energies in both directions and constantly bringing both the drill and the compressor to higher efficacy. As the business grew, the partnership of Sergeant & Cullingworth was formed, with shops at 22nd St. and Second Avenue, New York.

Again, turning from the task of manufacturing, Mr. Sergeant's interest was sold to the Ingersoll Drill Co. and he went to Colorado to put into practical operation some of his mining methods. He operated a silver mine for a time, but fortunately we may now say, it was not a success. Meanwhile he had developed another complete rock-drill with an entirely novel valve motion. Two patents on this drill are dated 1884. He brought this new drill East in 1886 and formed the Sergeant Drill Co., which began building the drill at Bridgeport, Conn. Two years later the new company joined hands with the Ingersoll interests and the Ingersoll-Sergeant Drill Co. was formed, with Mr. Sergeant as its first president. The new company's shops were at 9th Ave. and 27th St., these shops having been occupied for a short time previously by the firm of Sergeant & Cullingworth, which then went out of existence, Mr. Sergeant's interest in this firm having terminated before he went to Colorado.

Mr. Sergeant remained at the head of the company but a short time, he then disposing of the bulk of his interest, and going on a visit to London and Paris. He returned to the rock-drill business, this time as a director in the Ingersoll-Sergeant Company, with the purpose of devoting all his time to invention. He labored constantly in developing and improving the company's products and in spreading their application into new and wider fields, his most notable inventions being the Sergeant 'auxiliary' and 'arc' valve, tappet' rock-drills, the 'release rotation' for rock-drills, and the 'piston inlet' valve for air-compressors, all of which are in general and successful use today. He was also the originator of many new ideas in stone channeling and coal under-cutting.

In the days of the Sergeant & Cullingworth Co., in response to the solicitations of the management of the Third Avenue Elevated Railroad Co., of which he was then a director, for a device which would protect them from the constant losses accruing from the repeated use of uncancelled tickets, he designed the ticket-cancelling box now so familiar to the public, that so mutilates the ticket as to make it impossible to defraud the company by using it again.

Mr. Sergeant's inventive faculty and his suggestive ideas were devoted to the interests of the Ingersoll-Sergeant Co. for all the remaining years of his active life, and the business grew and prospered continually. The works at Easton, Pa., were occupied in 1873, the great shops at Phillipsburg becoming a necessity a decade later, the consolidation of the two foremost, but competing companies, in their line in the world into the Ingersoll-Rand Co. being also a natural sequence. He spent much of his time in Easton until two years ago, when failing health compelled him to give up his former activities.

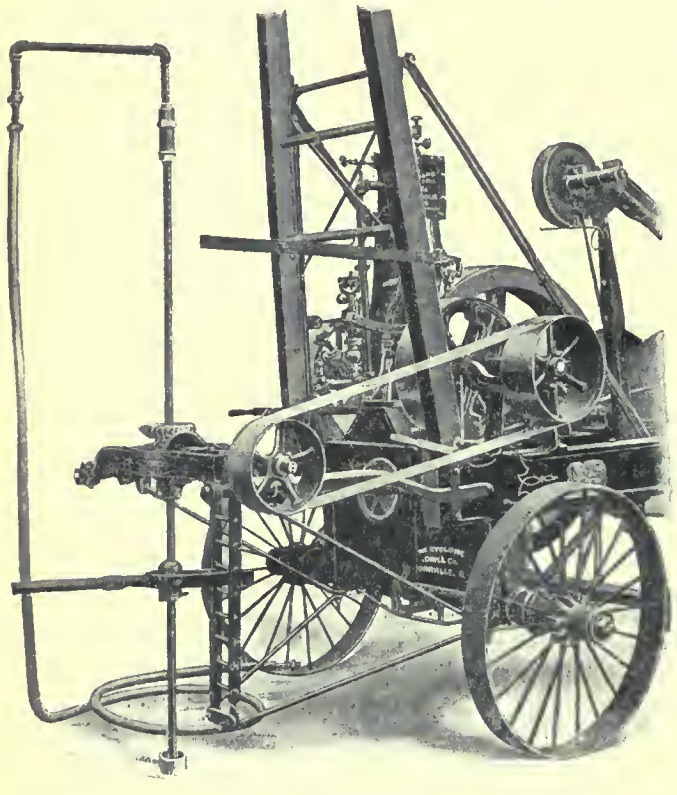
After the consolidation of the Ingersoll Sergeant and the Rand companies he still retained his interest, although his health would not permit his active participation.

In his early days Mr. Sergeant was never content to tarry long under fixed conditions or in the same place, and up to 1893 he had made his home in 26 different cities and towns. In that year he settled at Westfield, N. J., and at once took a deep interest in the growth of what was then but a small settlement. He built and owned at the time of his death the present home of the Westfield Club, the leading social organization of that neighborhood. He was a great sufferer from the rheumatism in his later years, but the immediate cause of his death was paralysis. He is survived by three daughters, a son, and a brother. Mr. Sergeant was a man of all embracing interests and of most extensive experience, a genial companion in the hours of leisure, as he was an indefatigable worker when anything was to be done. He was absolutely without ostentation and there was no suggestion about him of his talents or his achievements. He had, however, an unbounded confidence in his abilities, as all must have who accomplish much.

Mr. Sergeant is to be considered to have been a fortunate inventor, in that his inventions were so completely successful in the accomplishment of the purposes for which they were designed, and have attained such a leading position in the large operations that accompany the advance of modern civilized life, although he realized from them no great fortune, as fortunes go now, and at best attained little more than a modest competence.

The Cyclone Drill.

The Cyclone Drill Co., of Orrville, Ohio, which has been a leading manufacturer of prospecting drills for a number of years, has completed an addition to its plant that will more than double their capacity. The wood and paint shop building is 62 by 120 ft.; machine-shop addition, 40 by 64 ft.; and the forge-shop addition, 40 by 60 ft. New equipment is being added in each department. The company is now prepared to turn out an average of one cyclone drilling machine per day and it finds these increased facilities necessary owing to the growing demand for these drills. An important improvement has just been perfected for all these machines, which consists of a core attachment, enabling the prospector to obtain cores of just such part of the strata as he desires. By this means the character of the prospected area can be determined at any depth, at the minimum of cost; and a core can be extracted on any point desired without taking a core of the entire depth. Prospectors are advised to look into this new feature, and complete description will be sent on request. Prompt shipments will be made.



The Cyclone Drill.

Commercial Paragraphs.

THE ALLIS-CHALMERS CO., of Milwaukee, issue Bulletin No. 1,403, describing the Hancock jig, and stating the saving that has followed the use of this machine.

THE COMPRESSED AIR MACHINERY CO., of San Francisco, has been appointed Pacific Coast sales agent for the Olds Gas Power Co., of Lansing, Mich., and has a full stock of their gasoline engines.

THE CHICAGO PNEUMATIC TOOL CO., of Chicago, has prepared a handsome pamphlet, called the Electrical Tool Catalogue, No. 21, describing the electric drills, grinders, drilling stands, magnetic old-man hoists, etc., manufactured by them.

THE SULLIVAN MACHINERY CO., of Chicago, has established a branch office and warehouse at 12 South 20th St. Rock-drills and their parts, and other machinery will be carried in stock, for immediate shipment. Inquiries and specifications for mining and quarrying machinery are invited, and will receive prompt attention.

The new branch office of the LINK-BELT COMPANY, of Philadelphia, Chicago, and Indianapolis, is at No. 440 New York Block, Seattle, Wash.; E. G. Brabrook is in charge. Increasing business from the Far East, Washington, Oregon, and surrounding territory, in the conveying-machinery manufactured by the company, made personal representation on the Pacific Coast desirable.

THE RISDON IRON & LOCOMOTIVE WORKS report having closed a second contract for a 10-stamp mill for the Kodiak Gold Mining Co. This mill goes into Uyak, Alaska. It is a complete mill with concentrating plant and also has a large compressor plant. The entire outfit is to be run by water-power, there being a separate wheel for the mill, one for the concentrators and a large wheel on the compressor-shaft; the compressor is of a duplex type.

Books Received.

SYNOPSIS OF MINERAL CHARACTERS, by Ralph W. Richards, Assistant in Mineralogy, Harvard University. 12mo., 99 pages. Published by John Wiley & Sons. Price, $1.25. This is designed to present in a systematic form the essential characters and the simplest determinative reactions of the common minerals.

ELECTRICAL ENGINEERING, by E. Rosenberg. This is an elementary text-book suitable for those employed in the engineering trade, for students and for others that need a knowledge of the underlying principles of the subject. It is a translation from the German, revised by Edward B. Raymond. 8vo., 347 pages. Well illustrated. Published by John Wiley & Sons, and for sale by the MINING AND SCIENTIFIC PRESS, for two dollars.

SELF-PROPELLED VEHICLES.—A practical treatise on all forms of automobiles, by James E. Homans. Published by Theo. Audel & Co., 63 Fifth Ave., New York. The author has emphasized the practical aspects of motor vehicles of all powers, confining his space to the discussion of matters fundamental in construction and management. Theoretical matters — important almost wholly to designers and builders—are introduced only where good explanations positively require them, and at no point is the reader's mind burdened with padded material on experimental and obsolete construction.

Publications Received.

BULLETIN of the Massachusetts Institute of Technology; Vol. 42, No. 2.

ANNUAL REPORT of the Mining Industry of Idaho. 1906. By Robert N. Bell, State Inspector of Mines.

ILLINOIS STATE GEOLOGICAL SURVEY issues Bulletin No. 1 and No. 2, the first giving a geological map of Illinois, by Stuart Weller, and the second is devoted to 'The Petroleum Industry of Southeastern Illinois,' by W. S. Blackley.

ANNUAL REPORT of the Smithsonian Institution. 1905. This volume of 575 pages includes several important papers, such as those on 'The Genesis of the Diamond,' by Gardner F. Williams; 'Gold in Science and Industry,' by G. T. Bielby; 'History of Photography,' by Robert Hunt, and a number of other scientific articles.

Trade Treatises.

COLORADO IRON WORKS CO., Denver, issues Bulletin No. 25, describing their highly successful A & E slime concentrator.

THE GOHEEN MANUFACTURING CO., of Canton, Ohio, send us a copy of Zevy's 'Engineer's Book of Estimates,' a valuable series of forms and tables.

ALLIS-CHALMERS CO. issue a reprint of their Bulletin No. 1,038 on the 'Alternating Current Generator.' It is mainly a picture book, as the illustrations constitute the main interest of it.

INGERSOLL-RAND CO., of New York, issues Catalogue H 36, describing the Ingersoll-Sergeant class H air and gas compressors. The pamphlet is well illustrated and gives some useful information on duplex construction in this class of machines.

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Editorial.

WE REPRINT an interesting address delivered by Mr. F. W. McNair, president of the Michigan College of Mines, on deep mining in Michigan. As one of the leaders of the American Association for the Advancement of Science and as the head of the faculty in a school of mines that has won a reputation for practical teaching, he exemplifies the close relationship of science to industry.

BOSTON is likely to lose its distinction as the copper mining market; State Street is to become secondary to Wall Street, even in 'coppers.' Granby Consolidated has been listed on the New York Exchange, and Utah Consolidated is to follow. It is stated that the governors of the New York Stock Exchange are making concessions to mining companies to induce listing and to cause a growth of business in mining stocks. If this means that speculation in mining shares will be recognized to be as legitimate as any other form of stock gambling and if at the same time such dealings are to be placed under proper control, it will be well. At present the buying and selling of mining stocks is done mainly on that peripatetic market known as the Curb.

BERKELEY is becoming celebrated at this time by reason of the spirited effort being made to remove the seat of State government from Sacramento, and place it in the town usually identified with the University of California. It is probable that the Legislature will agree to submit the question of change, from Sacramento to Berkeley, to the people at the next general State election. Undoubtedly Berkeley is more convenient, being close to San Francisco and to other populous cities on the Bay; it is also a more pleasant and a more healthy place for the assembling of legislators. From the standpoint of site, no finer exists in the round world than on the lower slopes of the Contra Costa hills, facing the Golden Gate and affording a panorama in which the harbor and the estuary, the islands and the mountains, are canopied by the blue of a summer sky. But good scenery is wasted on a legislature, so there remains the fact that to the bulk of the population of the State, to politicians, to lobbyists, to reporters, and to those who have proper business at the capitol, the town in which we live is eminently accessible and desirable as a place of sojourn. There is left only the question of the effect on the University; at present, no selling of alcoholic stimulants is permitted within a mile of the campus; will this effort to safeguard youth be negatived by the introduction of the disreputable elements that hang about a legislative centre? Will contact with 'statesmen' undermine the ethics of the University student? Will he become too familiar with the actualities of graft? On the whole, we

think not. The capitol will be a couple of miles from the campus, and will exert no more influence on the life of the University than the neighboring city of San Francisco. Therefore, the town of Berkeley ought to sacrifice itself for the sake of the State and consent to becoming the seat of government.

The Position of the Railroads.

Signs multiply that the railroad companies are becoming aware of the growth of a public opinion unfriendly to them, for the financial papers of Boston and New York are publishing leading articles against the "unreasoning public sentiment" and the growth of "a lack of confidence on the part of investors" that it is feared may undermine the industrial stability of the country. The "anti-corporation propaganda" are imputed to hysteria and the community is urged to mind its own business and drop this senseless interference with the wheels of prosperity. On the page opposite we reprint portions of an article appearing in the current *Review of Reviews* that has the merit of voicing the general disgust with revelations of railroad inefficiency and corruption. It is a matter of importance to every one in the community and particularly to the miner, whose operations are usually conducted at such a distance from the manufacturing centres as to make him largely dependent on railroad transport. The disclosure of the part played by Pennsylvania Railroad officials in favoring coal companies in which they were stockholders, did undoubtedly astonish many people by whom this great railway system was considered a model of efficiency, but the practices exposed in this case are common among the smaller railroads in the West, the managers of which, either personally or in a corporate way, become interested in mines. In many cases preferential rates made to the owners of mines are based on mutual interests or personal factors, all of which seem harmless at first, but in the end are but insidious forms of corruption. Such dealings spring from the absence of a sense of responsibility to the community; there is a complete forgetfulness of the fact that the railroad has been granted a privilege that is to be used for the general good and not for private gain. Much in the same way the bigness of Mr. E. H. Harriman's manipulation of railroad stocks and his speculation with enormous sums of money has shocked some people, but to many others the magnitude of the transactions obscures the essential wrong. If a cashier of a country bank uses $5,000 to gamble on the race-track, the character of his performances is rightly appreciated, but if a railroad magnate plunges on Wall Street with about $50,000,000 of Union Pacific funds, he is dubbed a great financier. It is this tendency of railroad presidents to be speculators on a huge scale instead of attending to their duties as the chiefs of a big transportation business, that has shaken the faith of the community. There is too much attention to the ticker and too little to the road, too much reading of the tape and too little interest in departmental reports. And this applies, of course, not to the president only but to the whole run of officials to whom he sets a pernicious example; hence the mismanagement, the painful frequency of accidents, and the unprecedented freight congestion. A railroad is not a private undertaking, but a public institution. It may be that demagogues and journalists are exaggerating the existing evils and this exaggeration may create general lack of confidence, but that is bound to be the case whenever corruption is exposed. Life insurance is not disgraced because the Equitable got into a scandal, but the performances of Mr. Hyde and his friends opened the eyes of the policy-holders to the mismanagement of trust funds and prepared the way for a healthier tone in insurance matters. We hope the present campaign of inquiry will do a similar service for the railroads. They enjoy special privileges, they must use them wisely and for the benefit of the community, by whom they were granted; and this may seem a utopian sentiment to the people of California—a State debauched by the Southern Pacific for so long that its corrupting domination has become an accepted fact. We hope for the growth of a strong but sane sentiment on the subject, able to insist that a public franchise is not a mere synonym either for private or corporate betrayal of trust.

Larder Lake.

Any rich new district is apt to give rise to mining excitements of a spurious kind, especially in the surrounding region. Thus Goldfield and Tonopah have been the hatchery for a lot of small fry, that serve mainly to feed a gullible public. In the same way the fame of Cobalt has stimulated prospecting in northern Ontario and has been the cause of several booms. Among these is the Larder Lake excitement, which is attracting twenty prospectors per day, over the two available routes. We are in a position to warn real miners from going thither, for while there is plenty of quartz at Larder lake, it is very poor, so that while money may be made by buying and selling of claims, there is no present basis for a legitimate mining industry. There are no indications even of big bodies of quartz running four or five dollars per ton in gold. Nor are the conditions conducive to cheap mining. Being a flat country, shaft-sinking is necessary; water is plentiful and is likely to be troublesome; good timber is scarce, although there is plenty of slim poplars and spruce for fuel. The formation is a chloritic schist, with areas of quartzite. The quartz is of that milk-white kind that experienced men consider unfavorable; iron pyrite is abundant, but it is poor in gold. The region is unsurveyed, therefore much confusion and many lawsuits are inevitable and some claims will be annulled by reason of failure to make proper discovery. At present, most of the prospectors on the ground are woodsmen and farmers, with no experience of mining. In the Western States it would be foolish for a man to flourish an assay-certificate showing a dollar or less per ton and expect $5,000 for his claim, but that typifies the spirit prevailing in the Larder Lake district. Some purchases have been made even on this basis, but only with the idea of unloading on the public through the medium of a stock company. The local opinion is that one good find, which is yet to be made, will prevent a slump in the spring.

By the Way.

In the current issue of the *Review of Reviews* there is an excellent article on the railroad situation. In part, it is said:

The principal argument against such governmental ownership has been the superior practical efficiency of private direction and management. But unless conditions notoriously prevalent just now should soon be changed for the better, the public-ownership advocates will become confident and aggressive along a wholly new line of advance, where they have heretofore been on the defensive. They will point to the complete breaking down of efficiency in the actual business of transportation in this country, and will begin to claim that the Government could not possibly do things so badly.

Furthermore, they will point to the inability of the great railroad managers to obtain the money they need to make absolutely necessary improvements, whereas the Government of the United States could obtain almost unlimited capital at half the rate of interest the railroads would be obliged to pay. It does not follow that these new arguments will be conclusive. There is no evidence as yet to show that the people of the United States, justly exasperated with the railroad managers as they have become, are by any means prepared to throw the burden of railroad ownership and administration upon the United States Government. On the other hand, they will heartily support the Government in its present policy of investigating abuses. Government inquiry has disclosed the fact that, in spite of drastic laws, the railroads have been continuing the general practice of rebates and favoritism.

The responsible railroad managers have for several years past looked the country straight in the face and declared that they were scrupulously obeying the laws against discrimination. But when the Bureau of Corporations and the Interstate Commerce Commission proceed to make investigations, and the Department of Justice takes an active hand in the business, it turns out that by all sorts of ingenious methods, direct and indirect, the favored patrons of our railroads are aided by the railroad officials to break down their competitors in business. The bigger element of railroad men, instead of attending to the practical business for which the stockholders are supposed to be paying them their salaries, are to be found in Wall Street and in the large New York hotels, building up their private fortunes by day, and pursuing their pleasures by night. The smaller fry of railroad officials have been the holders of stocks in coal companies, grain elevator companies, and other enterprises along the line, and it would be absurd to deny that as the prevailing rule such companies and enterprises have been favored with a supply of freight cars and other facilities for doing business, when their competitors and the general public have been denied. When things like this have been alleged against railroad officials, they have turned their eyes to heaven with protestations against the injustice of such slanderous accusations. But a moderate amount of energetic effort on the part of the Government investigators brings these things to light.

The ordinary stockholder in the railroad is just as helpless as the unfavored shipper of freight. A great game of railroad strategy has been going on in Wall Street for years past, and one of its principal objects has been to freeze the small investor out, and to concentrate the actual ownership as well as the control of the railroads in a few hands. Thus the most conspicuous achievement of our boasted railroad system within the past few years has been the making of a group of multi-millionaires who have rendered little, if any, return to the stockholders or to the country for their vast acquisitions of wealth and power. They have juggled with securities, have played the stock market up and down, have played tricks with their dividend policies, have so falsified their bookkeeping as to conceal surpluses, and have virtually confiscated the property of the confiding stockholders by the use they have made of the proxies which they themselves have solicited through the mails, at the stockholders' expense.

While the railroad magnates have been thus engaged, this great country has been maturing in its agricultural and industrial life, and its domestic commerce has been increasing in volume and in value every day. If good railroad men—drawing their salaries, letting the stock market alone, and serving the interests of the general public and the honest investors in railroad securities—had been running the railroads and attending to their business in a proper way, there is not much reason to suppose that the railroads would not also have been developed and improved at an equal pace with the development and progress of the general business of the country. Our great prosperity has not come upon us unawares, and the failure of the railroads to respond efficiently to it is due to the fact that the railroad system has been used for making a set of individuals enormously rich at the expense of the country's prosperity. The 'magnates' have been engaged in getting control of railroad properties through the devious methods of corporation finance, and in unloading inflated securities upon the investing public. The country was prospering, railroad earnings were therefore improving, and the masters of railroad finance managed in one way or another to capitalize this increased earning capacity and to pocket the proceeds. These charges are not to be taken as applying to every railroad line or every railroad financier. But it is unquestionably true that a great part of the recent total increase of the capitalization of American railroads does not represent actual expenditure for improving the roads and their equipment, but rather represents the great game of private financiering, by means of which a set of men have rapidly become multi-millionaires. They have got control of the American railroad system, have bled it unmercifully for their own benefit, and the result is that it no longer serves the practical purposes for which railroads exist.

There are vast networks of railroads in this country where it is a needless expense to print timetables, because there is no longer any such thing as the operation of trains on schedule. There are sections of the country where the railroads are refusing to receive freight for shipment, either because they cannot supply the cars or cannot see any reasonable prospect of having them conveyed to the point of destination. It is true there has been rapid growth of population and traffic in the West, but this recent growth has been nothing like so rapid relatively as was that of the seventies and eighties. The railroads have had plenty of warning and abundance of opportunity to keep well abreast of the development of the country. No condemnation of their failure to do this is likely to be too drastic or to state the facts with serious exaggeration. Even the great Eastern trunk lines, serving a country that has been wealthy and prosperous for two generations, have come far short of showing reasonable foresight and due attention to the strict requirements of a legitimate transportation business. One or two fast trains to Chicago—at the expense of general demoralization of all the remaining volume of passenger business—have been about the only thing to which the managers of these roads could point as an example of enterprise.

Personal.

SAMUEL NEWHOUSE has returned from Cobalt to Salt Lake.

J. R. FINLAY is in New York, where he has decided to reside.

W. H. LANAGAN has returned from a short trip to Tonopah.

J. H. G. WOLF, of Manhattan, Nev., has been in San Francisco.

FRANK J. DAVEY, of Baker City, Oregon, is visiting San Francisco.

F. J. POPE is in Chile, examining mines for the Guggenheim people.

HORACE C. NICHOLS is now manager of the Ymir mine, British Columbia.

GEORGE L. EDDY is at North San Juan, in Nevada county, California.

F. L. MORRIS has opened an office in the Monadnock Bdg., San Francisco.

R. B. BINSMADE is engaged in examining mines in New Mexico and Arizona.

WALTER L. MAAS, of Salt Lake, is examining mines in Inyo county, California.

EDWARD HOOPER has gone to Siberia as consulting engineer to the Orsk Goldfields.

H. A. B. COOKE, of New York, is visiting San Francisco and other parts of California.

W. L. SAUNDERS, of the Ingersoll-Rand Co., is on his way to the Isthmus of Panama.

FREDERIC KEFFER has been nominated the president of the Canadian Mining Institute.

CHARLES C. GATES is the new manager of the Nevada United mines at Ward, Nevada.

C. L. GILSON has been appointed general superintendent for the Giroux Consolidated Co. at Ely, Nevada.

FRANK MCLENNAN, of Cornwall, Ont., has been made manager of the Cerro de Paseo Mining Company.

GEORGE GILL, who has been in the Cœur d'Alene lately, has gone to Sonora, Cal., where he will remain a couple of weeks.

C. B. LAKENAN has returned to California from Philadelphia, and after March 1 he will be stationed at Ely, Nevada.

H. KENYON BURCH, chief engineer for the Moctezuma Copper Co., is at New York, on a visit from Nacozari, Mexico.

FORBES RICKARD, on his return to Denver from a trip to the principal mining districts of British Columbia, has gone to Arizona.

FRANK G. WILLIS, of Cripple Creek, has been appointed consulting engineer of the Henry Adney mine, which recently changed hands.

JOHN T. HODSON and JOHN A. KIRBY, of Salt Lake, attended the annual meeting of the Nevada Hills Mining Co., at Goldfield on March 1.

THOMAS A. VARDEN, of the American Mining & Development Co., has been making an examination of the Uncle Sam mine, at Kennet, California.

HILLS & WILLIS, mining engineers, announce that they have opened an office in the McPhee Bdg., Denver. They retain their former office at Cripple Creek.

J. L. PARKER has resigned as manager of the Brown-Alaska Co., Prince of Wales Island, Alaska. He will open an office at Seattle, Wash., as a consulting mining engineer.

GEORGE A. LAIRD, superintendent of the Copper Queen Con. Co.'s Sierra de Cobre mines, at Cananea, Sonora, Mexico, and formerly manager of La Victoria y Anexas, at San Pedro, Mexico, has resigned his position with the Phelps-Dodge Co., and will enter into the general engineering business with Franklin W. Smith, of Franklin W. Smith & Co., at Bisbee, Arizona.

Homestake Output.

For the first time since its organization the Homestake Mining Co. has issued a semi-annual statement to its stockholders. The report shows that during the last six months of 1906 there was an increase in the values of the ore treated:

RECEIPTS.

From bullion	$2,750 197.58
Other sources	41,017.67
Total	$2,791,215.25
Operating expenses	1,993,680.71
Net earnings	$ 797,534.54
Dividends	$ 665.200.00
Added to surplus	142,334.54
Total	$ 797,534.50

Betterments and permanent improvements, included in and charged to operating expenses, are as follows:

Slime plant construction	$201,097.79
Water system and pipe-line	101,849.01
Sundry items	29,258.19
Total	$332,204.96
Property purchased, charged to operating expenses	$ 7,667.97
Average value per ton	3.818
Tons of ore milled	720,216

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, February 28.

Brunswick	$0.58	Lightner	$0.67
Con. Virginia	0.92	Savage	0.82
Mexican	0.85	Sierra Nevada	0.75
Ophir	2.55	Yellow Jacket	1.10
Belmont	5.40	Midway	2.05
Combination Fraction	5.10	Montana	3.65
Goldfield Con	10.00	Mohawk	17.50
Jim Butler	1.01	Red Top	4.30
Jumbo	4.20	Sandstorm	0.70
Jumping Jack	0.30	Silver Pick	1.45
Manhattan Con	0.83	Tonopah Ex	5.00

METAL PRICES.

By wire from New York.

	Average prices for week ending February 21.	February 28.
Copper—Lake (cents per lb)	25 @25½	25¼
" Electrolytic "	24¾ @25	24⅞
" Casting "	24¼ @24¾	24½
Lead "	6	6
Spelter "	6.75@ 6.80	6.85
Silver (cents per oz.)	68 ¾	69⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	February 21. £ s. d.	February 28. £ s. d.
Camp Bird	1 7 6	1 6 6
El Oro	1 13 0	1 10 6
Esperanza	2 11 3	2 6 3
Dolores	1 11 3	1 18 0 ex div.
Oroville Dredging	1 0 0	1 0 0
Stratton's Independence	0 3 3	0 3 0
Tomboy	2 1 6	1 18 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Feb. 21.	Feb. 28.
Bingham Central	1¾	1½
Boston Copper	30¼	29⅝
Calumet & Arizona	194	190
Cumberland Ely	12⅛	11⅝
Dolores	8½	9¾
El Rayo	5¾	5⅜
Guanajuato Con	4⅝	4¾
Giroux Con	10⅛	10
Greene Con	31⅜	30⅛
Nevada Con	18⅛	17⅜
Nipissing	13⅝	13⅜
Tennessee Copper	50¼	50
Tonopah Ex	4½	4½
Tonopah-Belmont	5¾	5
Tonopah	16½	16
United Copper	72	71¾
Utah Copper	38¼	38

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Mining Summary.

ARIZONA.

COCHISE COUNTY.

Labor conditions are still unsettled in Bisbee, and no change in the situation has occurred in the last week. About 800 men were discharged in one day, and since then small numbers have been laid off from time to time, many of them men who have been prominently connected with the movement to unionize the miners. It is evident that the mining companies are working out some policy which they have adopted to offset the move on the part of the Western Federation. Just what this policy is, remains a puzzle as yet, but the daily discharge of men at the various shafts seems to be a part of the program adopted by the operators. The merchants have refused to extend credit, and business will soon be done on a cash basis.

GILA COUNTY.

Reports continue to come in regarding the recent rich strike in the Old Dominion mine at Globe. It is said that 40 ft. of high-grade chalcocite ore has been cut by the cross-cut on the fourteenth level, and that no hanging wall has been encountered. Stoping will commence at once, as ore high in sulphur is badly needed by the Old Dominion smelter. The cross-cut has been connected by winzes with the twelfth level, which assures good ventilation. This ore is not a continuation of the west orebody, and lies almost directly beneath the old Interloper shaft, destroyed by fire a year ago. The old shaft was down 1,200 ft., and in 200 ft. more would have cut this orebody. The stock-pile at the smelter contains 10,000 tons of ore, and enlarged smelter capacity is badly needed. A fifth furnace is being added, which will increase the monthly output to 4,000,000 lb. The coke supply is increasing, and immense storage bins for coke and ore will be erected above the smelter, and will be connected by a spur with the company's railroad.

PIMA COUNTY.

Activity continues in the Bunker Hill district, north of Mammoth. The Calumet & Arizona Co. is working 25 men on the Copper Giant group of claims. A diamond-drill hole is down 1,000 ft. and has encountered ore, while on another claim the shaft is down 150 ft. A tunnel is being driven on the Copper Giant, and ore has been struck. ——The Copper Creek mine, which adjoins the C. & A. group, employs 45 men.

CALIFORNIA.

NEVADA COUNTY.

A company has been organized in Boston to operate the old Montana mine in Willow valley, near Nevada City. Some local men are interested in the move. The company will be called the Montana-California G. M. Co., and has both the North Montana and the Montana claims under a long-term bond. The property lies near the Colfax, Murchie, and Lecompton. A new boiler has been ordered, and sinking of the shaft will be continued below the 400-ft. level. It is reported that the mine has produced over $200,000.—— The Gaston and the Ethel mines near Gaston have been closed down, throwing 150 men out of employment. These mines were crippled by the lack of fuel and supplies, and the Gaston has been forced to pull the pumps out of the shaft, but will resume work in the lower tunnel in the spring.——The S. P. Railroad has started the construction of the track from Lincoln to the Dairy Farm mine, and the work will be completed in a few weeks. This will enable that company to ship the copper ore which has accumulated on the dumps.

SHASTA COUNTY.

The Trinity Copper Co. has entered into a contract with the American Smelting & Refining Co., and it is reported that they will immediately commence the shipment of ore to that company's smelters, which are being constructed at Carain, in Shasta county. Trinity ore has a gross value of about $12 per ton, with copper at 20 cents.——The Mountain Monarch mine, 10 miles west of Redding, is being developed rapidly, and shipments are expected in the spring. The ore is being developed through a tunnel.——The Midas mine, at Harrison gulch, is installing new machinery, including a powerful hoisting engine.

High water and muddy roads are delaying the progress at the iron smelter at Heroult, but the rock-crusher has been installed and has started to crush rock for the concrete work. The railroad from Kennett to Delamar, will be completed before the summer is over. It is reported at Kennett that the Guggenheims will take over the Golinsky mine. This is a copper property, consisting of 16 claims, and the Guggenheims have a bond on the group that still has several months to run. A force of 25 men is employed at the property. If this deal goes through, it may mean the erection of another smelter in the Kennett district.

SIERRA COUNTY.

Three shifts are working in the Eldorado mine, near Alleghany; 150 ft. of the tunnel has been finished and in 450 ft. more it is expected to strike the vein. The property is held under bond by H. L. Johnson, owner of the Tightner mine. This claim is situated on Kanaka creek, and on the same lode as the Plumbago mine.

TUOLUMNE COUNTY.

(Special Correspondence).—The Clio Power & Milling Co. has issued bonds for $250,000 preparatory to the resumption of operations at the Clio mine on an extensive scale. Several large orebodies of low and medium-grade ore have been opened up in this property. A recent report was that a 200-stamp mill would be erected.——The Lion G. M. Co. is making preparations to push development of the Ida Klein mine. A branch electric transmission line is being constructed from the main line at Quartz to the property, and a new electric hoist, a compressor and a 150-h.p. induction motor are being installed.——The Sonora and Dutfield mines, situated near the property of the Mountain Mining Co., northeast of Tuolumne, were bonded this week to an Austrian company. The price is $10,000, to be paid within two years.——Berkeley people have become interested in the Clark mine, situated one-half mile northeast of Tuolumne, and a contract will be let within a few days for the sinking of a shaft. Sufficient money has been deposited for development purposes for several months. The property has not undergone much development as yet, but shows excellent indications.——A large body of good-grade ore has been uncovered in the Presiosa mine, situated on the south side of the Tuolumne river, some eight miles above the Mohican. P. J. Maguire, the superintendent, intends running an adit from a point lower than the present workings to tap the shoot, and expects to build a mill on the property in the near future.——The Springfield T. & D. Co., which recently resumed work at its gravel property on Table Mtn., has a promising prospect, and feels confident of rich discoveries within a short time.——There is promise of a revival of operations at the Erin-Go-Braugh, situated near Stent.—— The Dutch mine, at Quartz, will shortly resume operations under the management of Geo. Ade.——A mill and mining machinery was purchased this week for the Bourbon mine, situated above Columbia.——A wagon road is being built to the Ellen Winton mine, where a mill will be erected shortly. Electric power will be used.

Tuolumne, Feb. 24.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Scotis Mines Co. is developing. Another level is being cleaned out and re-timbered, and a good streak of ore is showing in the heading. It is the intention of the manager, Owen Williams, to open up reserves of ore, to insure the constant running of the mill. Machine-drills will be installed.—— An important strike has just been made in the Silver Cloud mine, situated on Sherman Mtn. At a distance of 1,250 ft. from the portal of the Victoria adit this lode was intersected, and after driving west for 70 ft. a body of lead ore was uncovered, one foot in thickness. The ore contains 70% lead, and 90 oz. silver per ton. The ground is to be opened for 200 ft. before a stope will be started.—— A new adit has been started by the Krupp Mining Co. on Saxon Mtn. The bore is to be driven to catch the junction of the Bellmont and Friar Tuck lodes,

which show strong in surface workings. In the upper workings small bunches of ore have been encountered which milled as high as $200 per ton, gold, siver, and lead.—— A big streak of high-grade ore has been found in the Poor Man's Relief mine, situated in West Argentine. The ore-body measures from 8 to 10 in. across, and runs 2 oz. gold, and 60 oz. silver per ton. The ground is being opened preparatory to carrying a stope. W. A. Maxwell is the manager of the property.—— A pool of Idaho Springs business men has taken a lease on a large block of ground in the Bellevue-Hudson mine, situated on Columbian Mtn. A winze is being put down from the upper workings to connect with the tunnel level. A body of ore, measuring six inches in width, is exposed which carries 225 oz. silver per ton. Jacob Widetich is the superintendent.—— A. D. Bryant & Co., leasing on the Bellevue, are shipping high-grade ore. Two cars are sent to the Denver smelters per week. This is one of the best paying leases of the upper Clear Creek district, and the output will be heavy during the present year.—— Operations on the Paris group of claims on Griffith Mtn. are progressing. Driving is in progress on the Paris lode, which was cut 200 ft. from the portal of the adit, and a streak of ore 10 in. across is being followed, which is worth $30 per ton in silver and lead.—— Wm. M. Cooper, manager of the Capital Prize, is shipping a number of cars of ore to the ore-testing works at Denver, to determine the best method of treatment. A 200-ton concentrating plant will be built.—— The Millington mine, situated on Columbian Mtn., is being rejuvenated. Under the management of P. H. Stanhope the works are being cleaned out and re-timbered. Several sets of lessees are at work.—— Report is current that the Pay Rock group of mines on Republican Mtn. is to be bonded and leased to a syndicate of Denver capitalists. The deal will be consummated as soon as the owners, Hendrie & Bolthoff, of Denver, return from their European trip.——The Santiago mine, in East Argentine, is the scene of an important strike. In driving the fourth level a body of smelting ore three feet in width has been uncovered. Shipments are being made to the Santiago mill in Georgetown.—— A deal is now pending for the transfer of the Comet mine, near the summit of Griffith Mtn. This property has produced $1,000,000 from shaft workings to a depth of less than 500 ft. A body of quartz is showing, measuring 10 ft. in width, and mill runs returned 38 oz. silver per ton. Denver men are interested in the deal.—— The East Griffith is outputting concentrate and smelting ore. As the mill is now running on full time, it is possible to break the smelting product which has been left standing for a year. The output from this mine during the present year will be heavy.—— The American Sisters mine, situated on Columbian Mtn., is sending forth a good tonnage of smelting ore. Driving is still in progress on the 275-ft. level of the Headlight shaft, an 18-in. streak of high-grade ore being followed. The returns vary from 167 to 600 oz. silver per ton, with 25% lead.

Georgetown, Feb. 21.

GILPIN COUNTY.

The shaft on the West Calhoun property of the Jefferson-Calhoun company has reached a depth of 300 ft. and sinking has been discontinued. Driving is being done on the 275-ft. level, and connections will be made with the corresponding workings of the Kemp-Calhoun to the west of the shaft, as they have already been made on the 200-ft. level. At the main shaft, the Jefferson, the new steel head-frame is completed, and two 100-h.p. boilers are in place, and an 80-h.p. hoisting engine is being installed.——At the West Whiting mine, on Gunnell hill, stoping is being done on the west 400-ft. level. The ore is shipped by tramway to the Polar Star mill at Black Hawk.——The Aduddell property of the Taawasa company in Willis gulch is being worked by a force of 30 men, through the east shaft, which is down 548 ft. Several lessees are also working.——The Old Town shaft is now 1,670 ft. deep, and three shifts are working to lower it to the 2,300-ft. level, which will enable it to be connected with the lateral now being driven from the Newhouse tunnel by the Hot Time company, a subsidiary company of the Old Town Con. M. Co. Levels have been started at the 1,600-ft. point.

IDAHO.

BOISE COUNTY.

(Special Correspondence).—Herman Day and associates will begin work next spring at the mouth of Lewis gulch, a quarter of a mile above Centerville, and will employ 25 or 30 men. Their operations will be a new departure in the mining field in Boise basin, which has been a producer of gold only, as this company will mine for black sand, zircon, monozite, and platinum.

Spokane, Feb. 16.

SHOSHONE COUNTY.

(Special Correspondence).—Miners working in the cross-cut on the No. 10 level of the Bunker Hill & Sullivan mine at Wardner, famous as the greatest single producer of lead-silver in the world, broke into the shoot of the level above, known as the March stope, a few days ago, exposing an orebody of a value estimated at $50,000,000. The official report of the strike shows the shoot is opening more favorably than did level No. 9, which was the wonder of the mining world because of its length, breadth, and quality of ore. The March stope was proved for more than 300 ft. in length and 100 ft. in width, with 30 ft. of clean shipping ore. The Bunker Hill & Sullivan mine was discovered by a mule owned by Spokane men, who prospected in the Idaho hills several years during the early '80s. Afterward it passed to Jim Wardner, who transferred it 20 years ago to a syndicate for less than $1,000,000. It has payed $8,226,000 in dividends to stockholders in the closed corporation, to date, and the monthly dividend of $180,000 has been paid for years.—— H. Woodward, of Lynn, Mass., representing the heirs of Lydia Pinkham, has bought 600,000 shares of Ajax stock, paying 12c. per share. This gives the Pinkhams and L. W. Hutton absolute control. The mine was shut down a month ago because of lack of harmony among the stockholders, but the transfer of control will mean the resumption of work.—— The Diamond Drill Contracting Co., of Spokane, has taken a contract for 5,000 ft. of drilling in the Snow-storm mine, near Mullan.—— A strike of importance has been made in quartzite on the Hennessy-Burns group, part of which is in Idaho, the other in Montana. A four-inch streak of galena carries 68% lead and 10 oz. silver. It is expected shipping will begin in 30 days.—— The Idaho Spring Gulch M. & M. Co. reports that the lode, nearly horizontal, has straightened and is now vertical. It has been decided to cross-cut the vein to the hanging wall and then run a lower tunnel 700 ft. to cut the vein at 600 ft. The new officers of the company are: Fred Carson, president, and William Coumerilh, treasurer.—— C. A. Pooley of the Morning mine, at Mullan, has secured nine claims, five of which are patented, near the old Iron Mtn. mine, 40 miles east of Mullan. The claims were worked in 1891, and shipped $150,000 worth of ore. The formation is porphyry, quartzite, and slate, the veins are fissures, and one is 40 ft. wide. One vein carries ore running 12% copper, and 50 oz. silver. The other carries silver-lead ore of good value.—— Reports from the Stewart mine, F. A. Heinze's property, near Wardner, are that the property is in excellent condition. The pay-shoots have been opened, and the workings of the mine are in ore. Heinze and his associates own or hold by option 94% of the stock, which leaves only 60,000 shares loose. Of this stock about 15,000 shares are held in Spokane, and 27,000 shares at Wallace. It is given out that that the largest concentrator in the district will be installed.

Spokane, Feb. 22.

NEVADA.

DOUGLAS COUNTY.

(Special Correspondence).—Buckskin is on the west side of Smith valley, 16 miles west of Yerington and 16 miles by stage from Wabuska. The camp is in a low range of hills, the country-rock being andesite and limestone. One of the principal properties is the Kennedy Consolidated, which has considerable development. Gold occurs in the first 50 ft. in depth, below which is a chalcopyrite, running well in gold and copper. W. C. Pitt, W. D. Kennedy, and others control the property. It has six shafts, averaging 70 ft. deep. The Nevada-Bullion, on which a few thousand dollars have been spent in development, has a showing of similar ore.

This is in charge of T. L. Hoppin of Yerington, who is interested with A. D. McEvoy, W. B. Watlington, R. P. Wompler, and F. S. Smith. Other groups being developed are the Mineral Farm, the Burke & McLaughlin, Original Buckskin, and others. Much interest is taken in the camp by Tonopah and Goldfield parties.

Wabuska, Feb. 21.

LINCOLN COUNTY.

(Special Correspondence).—Crescent is excited over the four strikes that have been made during the past week. A. J. Waddleton of the Golden Crescent Co. was the first to report the find that was made in the Syndicate tunnel, where 20 ft. of vein matter was cross-cut, with some copper ore, carrying gold. Following this came the report of the strike on the Old Mexican mine, owned by the Crescent Searchlight Co., where in a winze, 165 ft. from the mouth of the shaft, five feet of ore has been encountered. This property has shipped some ore and is now being developed by G. W. Huntington. The next and probably the richest find was made in the Yaqui mine, situated three miles east of Crescent peak. There are 13 veins traversing this property, upon which some surface work has been done. C. M. White, the superintendent, uncovered a four-foot vein that assays from $17 to $100. The copper strike on the Chilstrom group has also caused excitement. Three samples gave an average assay of $109 showing 20% copper and the balance in equal proportions of gold and silver. Crescent is filled with mining men that are here on a tour of inspection.

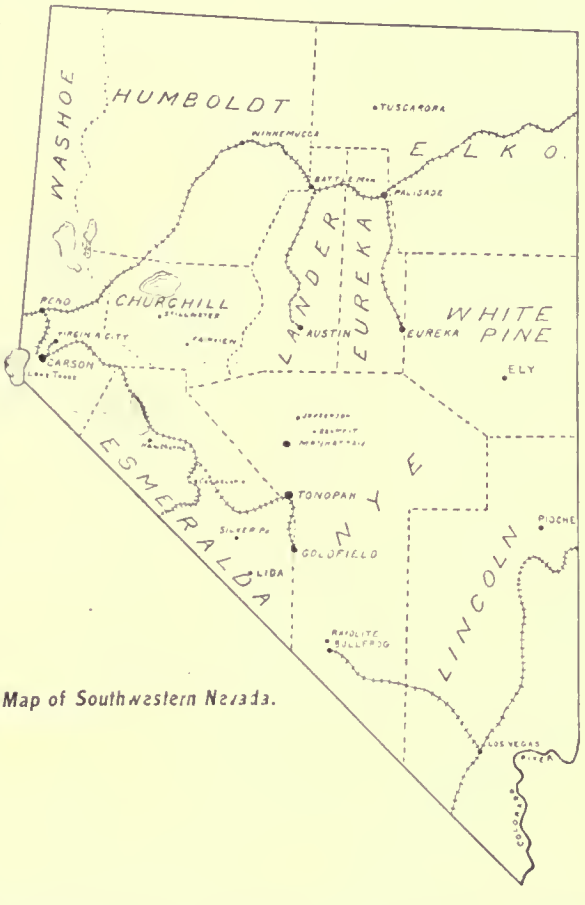
Searchlight, Feb. 21.

NYE COUNTY.

(Special Correspondence).—The new mill of the Desert Power & Mill Co., which is the name of the power and milling concern of the Tonopah Mining Co., is located at Millers station, 10 miles west of Tonopah, on a desert flat, where an abundance of water is obtained from wells, at no great depth. The mill has three crushers; 100 stamps of 1,050 lb. each; five Huntington mills; a 30-ft. and a 54-ft. sand-wheel; a Robins automatic tripper that brings the ore to the battery bins; classifying cones; 20 Wilfley tables; eight vats, 36 by 20 ft., equipped with agitators; four collecting sand tanks, 33 by 8 ft., and 18 leaching tanks, 33 by 8 ft.; also Blaisdell excavators, Butters distributors, and Butters vacuum filters. The ore is reduced to 1½-in. size before it passes to the stamp batteries; 500 tons of ore are reduced to this size in eight hours by the crushers. The battery water is cyanide solution, and 16-mesh screens are used. The pulp passing these screens goes to a series of cone classifiers, being elevated to the classifiers by a 30-ft. sand-wheel. Extra cyanide solution is added to the classifiers for an upward current. The overflow from the classifiers is conveyed to Wilfley tables; the coarse product is re-ground in Huntington mills having 30-mesh screens, the pulp then passing to the tables. The tailing and middling from the Wilfley tables are elevated by the 54-ft. sand-wheel to a set of double cone-classifiers. The overflow from the latter goes to the slime vats and the coarse to the main leaching vats. The tables make a concentrate that runs high in silver sulphide and pyrite. In this work it is expected to obtain one ton of concentrate from each 60 tons of ore passed through the mill. The slime material, after being leached in connection with agitation, is passed to the Butters filters, through which the clear solution comes. The usual form of zinc box is used, with zinc shavings. A complete refining equipment is installed at the mill. The power plant consists of Babcock & Wilcox boilers of 800-h.p. capacity, equipped for both coal and oil as fuel; four Westinghouse electric generators, three of 250 and one of 300 k.w. capacity. This supplies power for the mill, for the company's mines at Tonopah, and for the sampling plant of the Western Ore Purchasing Co. at Millers. F. A. Keith is general manager for the Tonopah Mining Co. and its subsidiary companies; R. Chester Turner is mine superintendent; A. R. Parsons, mill superintendent, and S. J. Kidder, assistant.

The Tonopah-Belmont M. Co., a subordinate of the Tonopah M. Co., is erecting a 60-stamp mill at Millers, and its equipment throughout will be similar to that of the mill above described. Mr. Parsons will also have charge of this mill, W. H. Blackburn being superintendent of the mine at Tonopah.

The Tonopah Mining Co. has cut a station at the 600-ft. level in the Silver Top shaft, and will begin driving as soon as sufficient power is available, its power now being limited by lack of fuel. The company has also cut a station at 600 ft. in the Valley View shaft, and a station is being cut at 900 ft. in the Mizpah shaft. Within the last year a large amount of driving has been done on the Mizpah's 600-ft. level. Extensive building improvements have been made during the past year, including buildings for staff employes, and new head-frames at the Silver Top and Red Plume shafts. A new compressor was also installed.—— Ore production in the Tonopah district has been, and still is, very much curtailed by reason of the fuel famine, and milling operations are greatly hindered. The power-plant of the Tonopah Mining Co., at Millers, is closed down because of the company's inability to obtain either coal or oil as fuel for the boilers. The boilers are equipped for both kinds. The 500-ton mill of the Tonopah Mining Co., at Millers,



Map of Southwestern Nevada.

derives its power from the electric plant referred to, and the mill is idle. Practically all the hoisting is done by electric power at this company's mines, and the shutting off of its own power supply has greatly interfered with the mine work; the company has, however, been able to buy some power from the Bishop Creek, California, plant, but it is stated that the latter's capacity is now overtaxed. Other companies in the district have suffered in like manner, and the effect will be to cut down the year's production. The main cause of all this is said to be shortage of cars, and the unwillingness of the large transportation companies to allow their cars to go off the main lines. Some relief is anticipated for this district and Goldfield as soon as the railroad line now being built from Beatty to Goldfield is finished. Its completion is only a few weeks ahead. This will afford an outlet to the San Pedro and Santa Fe lines to the south, and ought to facilitate the hauling of both coal and oil to this section. The Bodie & Mono Lake Railroad will be connected with Benton station on the Carson & Colorado Railroad this year, which will open up the Sierra Nevada timber-belt to this section. The latter road is now controlled by the Oregon Short Line.

Tonopah, Feb. 22.

OREGON.

BAKER COUNTY.

A rich strike was made at the Alamo, at a depth of 800 ft.——The Kendall and Dearinger leases on the Buffalo are shipping to the smelter.——The Red Boy mine is to be operated again by a new company. This property was a famous producer at one time, but its richest pay-shoot pinched out and some complex financiering of the company resulted disastrously, so that the property passed into the hands of a receiver.——B. S. Schlessinger is the new superintendent of the Standard Con. company.——The stamp-frames at the Columbia mill are being replaced by new material.——The smelter at Baker City has blown in for a short run. More ore is on hand than the amount of fuel available will handle, but it is hoped that by April the plant can be running continuously.

WASHINGTON.

State Coal Mine Inspector D. C. Botting has filed with Governor Mead a report showing the total coal production of the State of Washington for October, November, and December, 1906. His biennial report recently submitted carried the statistics on production to October 1, 1906. This supplemental report shows that the total coal production of the State was 2,846,901 tons for the year 1905, and an increase of about 15½% in 1906. The total production for the last three months of 1906 was 880,412 tons.

CHELAN COUNTY.

(Special Correspondence).—The Washington-Meteor Mining Co. is operating at Blewett, on the east slope of the Cascades, 12 miles south of the Great Northern railroad. It has been developing for some time and reports having four miles of underground work, in cross-cuts and adits, opening three well-defined veins of ore. The equipment consists of a 20-stamp mill, with concentrators and a cyanide plant, the machinery being operated by electric power. The mill will be started in the spring.——The Standard Reduction & Development Co., with offices in Seattle, is planning to erect a concentrator and leaching plant at its property on the Stehekin river, northwest of Lake Chelan. Extensive tunneling is planned. Present work has developed bodies of ore carrying silver, lead, and copper. Much of the copper ore is carbonate and it is to treat this kind that a leaching plant is to be erected. The concentrator will be for the silver-lead ores. S. S. Fluhart, the manager, states that the camp is to be tapped by a railroad which will pass up the Skagit, across Cascade pass, thence down the Stehekin to Lake Chelan.

Portland, Feb. 1.

FERRY COUNTY.

(Special Correspondence).—A new effort is being made to consolidate the mining interests of Republic camp under one ownership and management, on the plan proposed some months ago by Wm. B. Potter, of the St. Louis Sampling & Testing Works, which was to bond and lease the mines, install heavy machinery, and develop them on an extensive scale; the royalty under the leases to be paid as a part of the purchase price; also to install a mill of 500 tons daily capacity. The parties interested are Montana men, who are backed by New York capital and are assured of the requisite method for treating the ores. While the names of these people are witheld, the consideration for each of the mines is said to be greater than was proposed by Prof. Potter.——A large body of arsenical iron ore has been uncovered in the Pin Money shaft, on the Oversight group of claims, which, according to grab samples, will average $1,000 per carload. This ore underlies the oxidized material, which goes down to a depth of about 60 ft. The shaft is down 70 ft., and the body of ore improves in size and value with depth. The Oversight M. & M. Co. is pushing development and employing extra men. About 1,000 ft. of 2-in. pipe has been laid between the power-plant and the Pin Money shaft, and machine-drills are used in place of hand-drills. A gasoline hoist has been ordered, which will be installed by March 1. The vein in the Pin Money ground is distinct from four others on the group, both in character and value, the ore in the former being chiefly gold, while that in the other veins assays less in gold and contains a larger amount of iron. There is a wide difference also in other constituents. On account of the higher value, the Pin Money ore will be hauled by teams to the Washington & Great Northern Railroad, but from the other veins no ore will be shipped until after the completion of a tramway, from the Oversight claims out to the tram. During the past few weeks the Oversight company has been experimenting to ascertain whether the surface oxidized ores on its claims can be treated by cyanidation. E. J. Delbridge, the manager, is preparing to ship several tons of ore to Denver for final testing, and, if the results are satisfactory, the company will install a plant. The result of these tests is a matter of great importance to the neighboring mines in the Belcher district, as well as the Oversight, as there are hundreds of thousands of tons of such ore that may be treated at home at a less cost per ton than that of transportation to the distant smelters.——At 110 ft. from the portal, in the new adit on the Mountain Boy claim, at Park City, a blind quartz vein was recently encountered which has been penetrated six feet without reaching the foot-wall. The ore assays in lead and silver over $40 per ton, the lead being of the most value.

Republic, Feb. 23.

OKANOGAN COUNTY.

(Special Correspondence).—George F. McLeod has acquired controlling interest in the Butcher Boy mine near Chesaw, Wash. The Butcher Boy is one of the leading gold properties in Okanogan county, and was recently operated. It was the first steady shipper in camp. The ore is taken from a four-foot vein on the 100-ft. level and the shipments made last summer and fall to the Granby smelter netted more than $1,000 per car.——Spokane men have purchased the Mistletoe group of three claims in the Twisp district, Wash., the price being $60,000. The claims lie near the Alder group. L. H. Prather is president, and J. S. Pence, treasurer. The claims are traversed by a vein which crops for a width of 150 ft. on the surface.——Strikes of galena were made a few days ago in Old Germany group of claims in the Okanogan district, Washington. In sinking the shaft a vein was opened and a cross-cut showed good shipping ore. A good wagon-road will be built to the mine early in the spring.——Miners from the Bluffton mine, two miles north of Chesaw, report that the vein has been encountered. The tunnel has a depth of 250 ft.——Another strike of antimony has been made in the Dixie Queen mine, near Methow, Wash. The property is owned by the Antimony Queen Mining Co., and during the progress of its development has shown some phenomenal antimony ore. This is the second strike of importance made in this property within six months. Two crews are working, one driving in the tunnel and the other breaking and sacking ore for shipment. Contracts for hauling 100 tons of ore from the mine to Pateros on the Columbia river have been let and ore is being taken down on sleds. A 20-ton antimony smelter may be built the coming summer.

Spokane, Feb. 16.

SKAMANIA COUNTY.

(Special Correspondence).—The Metaline mining district is on the Pend d'Oreille river, 65 miles north of Newport, the latter being on the Great Northern railroad. As a lead district it has been known for 20 years, but progress in mining there has been retarded by the fact that the ores are rather low in lead and contain very little silver. Good progress has been made within the past year, however, by the Metaline Lead Co., Metaline Mining & Smelting Co., Mammoth M. & S. Co., the Lead King Mines Co., and the Larson Lead Co. Development work has opened large bodies of lead ore, and before the end of this year it is believed the district will be a producer. The ores, which are entirely sulphides, occur in two kinds of deposits—in irregular bodies within the limestone, and at the contact of dolomite and limestone. The gangue is an altered limestone. The ores require concentrating before shipment, and it is announced that the Spokane Lead Mines Co. and the Larson Lead Co. will erect concentrating mills this season. Part of the transportation from Metaline district to Newport is by boat on the Pend d'Oreille river.

Spokane, Feb. 10.

BRITISH COLUMBIA.

Lack of cars and shortage of coke are still features at the mines of the district. During the week ending Feb. 16, the Centre Star shipped 1,136 tons; Le Roi, 2,175; Le Roi No. 2, 385; and White Bear, 70 tons.——Le Roi was forced to close down for a few days, owing to shortage of cars. Work in the shaft continues.——The ore-shoot at the White Bear, which was first discovered by a diamond-drill, and afterwards opened by a drift on the 800 level, is looking well and promises to be the best asset of the mine.——The new 300-h.p. dynamo at the Trail plant has been put in operation, and the capacity of the refinery has been increased from 50 to 75 tons per day. Besides ore from Rossland, shipments were received from other mines at the Trail smelter during the week ending Feb. 16, as follows: St. Eugene, Moyie, 345 tons; La Plata, Kokanee creek, 16; Spokane, 73; Ottawa, Slocan, 23; Whitewater, 74; Hunter, 128; Washington, 23; Lorna Doone, 22; Lally, 22; Lone Bachelor, 25; and Northern Light, 24 tons.——Le Roi smelter at Northport is still closed down, owing to a shortage of coke.

In the Boundary district, little ore is being moved, except by the Great Northern railroad to Grand Forks. The Granby mines shipped, during the week, 8,340 tons to the Granby smelter; to the B. C. copper smelter there were shipped 1,800 tons from the Mother Lode; from Emma, 132; and from the Snowshoe, 450 tons. To the Trail smelter from Snowshoe, 450 tons; to the Dominion Copper Co.'s smelter from Sunset, 100 tons; to Nelson smelter from Skylark, 20 tons. The total shipments for the week were 12,322 tons, and for the year, to date, 90,195 tons.——A large party of students from McGill University will visit the British Columbia mines during the summer months.

It is reported in Vancouver that the McGillivray Creek mines, on Anderson lake, will be reopened next season. There is a 20-stamp mill on the property that has been idle for three years, owing to lack of capital. The ore is a free-milling gold-quartz, and two tunnels, each 200 ft. long, have been run upon the vein.——In the Bridge River country the Lorne property has been recently worked, an arastra being used for reduction of the ore.——The hydraulic mines on Alexander creek, 34 miles west of Lillooet, are to be worked extensively. A four-mile pipe-line will be constructed, and all the properties worked under one management.——It is reported that ample funds have been raised to pay off the indebtedness of the Ymir mine. This will mean the immediate resumption of work at the mine, which is already opened to the 1,000-ft. level, and has an 80-stamp mill, and a tailing cyanide plant with a capacity of 200 tons per day. The mine is developed by a series of cross-cut tunnels, drifts, and raises.

MEXICO.

CHIHUAHUA.

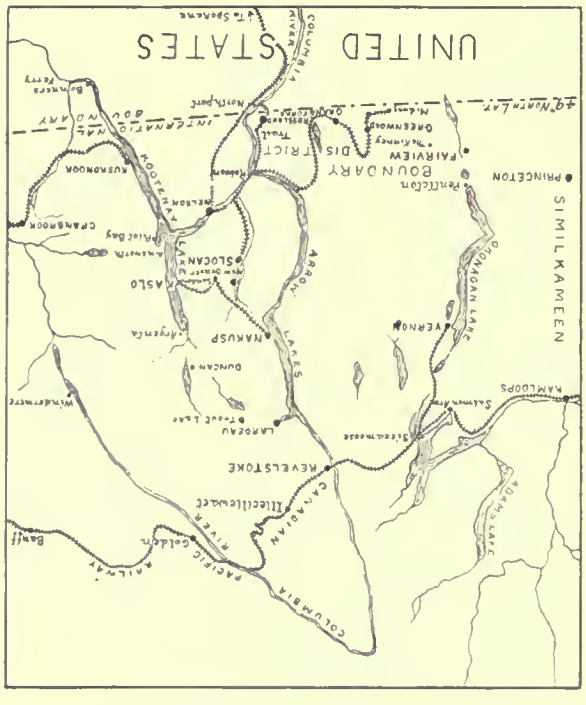
James E. Hyslop is authority for the statement of the affairs of the San Francisco del Oro property, after three years of development under his charge. An ore reserve of 300,000 tons is claimed, averaging 26 oz. silver, 11% lead, and 23% zinc; $375,000 has gone for development, and a profit of $250,000 has been made. Machine-drills are in use, and electric hoists and pumps are in operation. There are three working shafts on the property, and the fourth level has been reached. A concentrating plant will be built, to be preceded by an experimental plant of 50-tons capacity.——The Naica mine, in Chihuahua, paid 50 dividends during 1906, including $312,000, in the last six months. A good body of ore has been struck on the San Antonio, and is being developed. Labor is scarce at this property, which limits the production to about 100 tons per day at present. The company has had as much as 200,000 tons of ore stored, awaiting shipment facilities.——It is stated that the smelter at the Magistral copper mines is to be started. The mines belonged to individuals, were operated by a company, closed down three years ago, and now a new company has taken them over.——During the week ending Feb. 2, the mines of Parral sent 1,820 tons of ore to the smelters, and treated locally 2,175, making a total for the week of 3,995 tons.——The new head-frame at El Tajo mine of the American Zinc Extraction Co. has been completed, and the hoisting machinery should arrive soon. The mine is shipping steadily.——Work on the new power and reduction plants of the Veta Colorado M. & S. Co. is progressing rapidly.

COAHUILA.

A new coal-washer will be installed at the property of the Compania Carbonifera de Sabinos, at Rosita. The output of the mines will be increased to 2,000 tons per day. A railroad has been built from the Rosita to the city of Sabinas, and a contract has been signed with the Mexican Central to supply it with 10,000 tons per month.

DURANGO.

(Special Correspondence).—M. E. MacDonald has been for about six weeks at Topia, Durango, where he and his brother Bernard have purchased a mine. Topia is a beautiful little camp on the Pacific slope of the Sierra Madres at an elevation of about 6,000 ft., and about some 60 miles east of Culiacan. It is a lead-silver camp which has been worked by the Mexicans for years. The ore is a high grade lead-silver ore running from 20 to 40% lead and about 3 kilos in silver. The ore in the veins is from 15 in. to 5 ft. wide. The



Map of Part of British Columbia.

method of treatment is hand-jigging and concentrating the lead, and lixiviating the tailing. The concentrates are smelted in small smelters. In most cases the silver is separated from the lead in the smelters and either shipped to Mexico City or Culiacan. The lead bars and litharge are allowed to remain in Topia. They would pay to ship, but the scarcity of pack-animals prevents them from being marketed. It is expected in the near future that a railroad will be built fromCulican into Topia, but it is expected that they will start soon, as the parties interested in the road are buying up large tracts of timber lands.——Good progress is being made at Guanajuato. There is now a mill of 100 stamps in operation at La Luz. This mill belongs to the Guanajuato Amalgamated Gold Mines Co., which is principally owned by the Al Adams family of New York. A 40-stamp mill on the San Prospero property owned by Mr. Peck of Colorado Springs is in operation, and 100 stamps are working on the Peregrina ores. Mr. Van Law is working successfully his 80-stamp mill on the dumps of the Valenciana and Rayas mines. The Guanajuato Consolidated has its 80-stamp mill in full operation and is, as usual, doing very nicely. In the last three months they have opened up a big orebody below the fifth level in the Sirena, which has $1,500,000 gross ore in sight. This is called the San Francisco ore-shoot. Winzes are being sunk on other orebodies and recently one has opened into ore averaging 4 kilos for a width of 6 feet.

Durango, Feb. 25.

Special Correspondence.

Salt Lake, Utah.

Another Copper Smelter.— Settlement Between Smelting Companies and Farmers.— New Railroad to Ely.— News From Bingham. More Railroad Facilities.

The ore and bullion settlements reported during the past week aggregated $606,600.—— Sidney M. Bamberger, manager of the mining interests controlled by his father, Simon Bamberger, has made the announcement that another copper smelter will be built somewhere near Salt Lake City during the present year. While the plant will be erected ostensibly for the purpose of treating the ores of the Carisa mine at Tintic, and the Fortuna, Bingham Mary, and Argentine mines of Bingham, it will be open to the treatment of custom ores. It is likely that the ores of the Daly-West, Daly, Ontario, and Nailriver mines at Park City, and Ely Witch mine at Ely, Nevada, operated under the management of Ernest Bamberger, will be diverted to the new smelter. The initial capacity of the plant will be 250 tons of ore per day.

Since the American Smelting & Refining Co. has reached an agreement with the farmers that appeared as plaintiffs in the late smoke suits tried before Judge Marshall of the Federal Court, the remaining smelting concerns are negotiating along the same lines with the hope that they, too, may reach a similar understanding, all of which is contingent upon the Court entering a stipulation modifying his late decree. The Court, it will be remembered, enjoined the smelting companies from treating an ore or combination of ores carrying more than 10% sulphur in the charge. The A. S. & R. Co. has shown to the satisfaction of the farmers that with the system of bag-houses and cooling-chambers, which it now has in process of installation, practically all the flue-dust can be saved and the obnoxious gases eliminated to the extent that the possibility of damage to growing vegetation will be reduced to a minimum. The Bingham Con., United States, and Utah Con. companies deem it would be unfair for either the farmers or the Court to discriminate in favor of the A. S. & R. Co.; therefore they believe their case has been strengthened by reason of the compact between the last named corporation and the farmers. In the meantime the matter of concluding arrangements to move elsewhere, or out of the Salt Lake valley entirely, is held in abeyance.

Some strong financial interests are behind a scheme to build a railroad from Salt Lake direct to Ely, Nevada, through the Deep Creek mining district. It is said that the scheme contemplates an extension of the line to Tonopah, in the event that the Brock system does not build to Ely. The primary object, however, is to provide more direct connections with Ely. The line would undoubtedly be a paying one for the reason that it would tap several good mining districts on the way and should capture the bulk of the freight and passenger business between Ely and Salt Lake.

The management of the Albion Mining Co. at Alta is giving consideration to the erection of a concentrating mill. The mine will be a regular shipper of crude ore after May 1. William Hatfield of Provo is president of the company.——The Utah Apex Mining Co. at Bingham maintains shipments at the rate of 100 tons of ore daily. ——Construction work on the plant of the Markham Gulch Milling Co., also at Bingham, is progressing; but delay has been experienced on account of the delay in delivery of material.

The adit being driven in the Phoenix mine, at Bingham, has been advanced a distance of over 2,000 ft. When connected with the upper workings it will become the main avenue through which future operations will be conducted. The mill is turning out about 25 tons of concentrate daily, while the shipments of crude ore amount to about 25 tons. It is the intention of the management to increase the mill capacity.——The statement has come from an authoritative source to the effect that the Rio Grande Western railroad is likely to take steps in the near future to extend its system of tracks into the camp of Bingham. Notwithstanding that it has its second line in the camp practically completed, the management realizes that the development of the mines there has been so rapid that with its present facilities it is a grave question with them if the road will be in position to handle the traffic coming to it; particularly after the new mills of the Utah Copper and Boston Consolidated companies at Bingham get to work.

Tonopah, Nevada.

The Tonopah-Midway Co.—A New Mill for the Montana-Tonopah.— The Tonopah Extension.—Big Width of Ore.—A Mill to be Built. —The Butters Plant at Virginia City.

The Tonopah-Midway Mining Co., for which W. J. Douglas is the general manager, and R. W. Condon, superintendent, is shipping about 100 tons of ore per week to the plant of the Western Ore Purchasing Co., at Millers. This mine has the same system of veins as the Montana-Tonopah. Its main shaft is 835 ft. deep. It was sunk on one side of the orebodies, the latter being opened by cross-cuts from the 435, 535, and 635-ft. stations. The dip of the vein is such that from 300 to 400 ft. will have to be driven on the 835-ft. level to reach the ore. The ores are characteristic of the district, the relative values being about one-third gold and two-thirds silver.

The new mill of the Montana-Tonopah M. Co., at Tonopah, will be completed within a few weeks. It will have three crushers, 40 stamps, eight Wilfley tables, 16 Frue vanners, two tube mills, and a cyaniding equipment, with Hendryx agitators and Butters filters. The first section contains the crushing, grinding, classifying, and concentrating equipment; the second section, farther down the hill, contains the cyanide plants. In this mill the crushing and grinding are not to be done in cyanide solution, as in some of the other mills of the district. The process is one of concentration and cyanidation of tailings. F. L. Bosqui, metallurgist for the company, has general supervision of mill construction.

The main working shaft of the Tonopah Extension Mining Co. has reached a depth of 910 ft., and J. G. Kirchen, the manager, states that sinking is progressing at the rate of 80 ft. per month. The shaft passes through the vein at a depth of 220 ft., the dip of the lode being 48° toward the north. Levels are run into the ore from each 100-ft. station. It is stated that the width of ore varies from 16 to 40 ft. One of the best stopes has 40 ft. of ore. The shipping ore lies along both foot and hanging walls, with milling ore between. That running $20 to $30 per ton is graded as milling ore, the shipping ore running from $30 to $150 per ton. The mine is shipping from 350 to 400 tons per week, all of which is taken from the stopes on and above the 600-ft. level. On the stations below the 600 level, cross-cuts are being driven to the ore. The gangue is quartz and silicified andesite. Tests of the ore have been made, and plans are completed for a milling plant, which will provide for concentration, and cyanidation of tailings. The exact location of the proposed mill has not been determined upon. The plant will have a

capacity of 700 tons per 24 hours. In the meantime the work of blocking out ore goes on at a good rate.

The Virginia City plant of the Charles Butters Co. was erected to treat the material from an old mill-dump, by separating the sand from the slime. The sand was cyanided by the ordinary method, and the slime was treated by agitation in cyanide solution and in vacuum filters of the Butters type. A large tonnage was treated in this way, and while the percentage of extraction was variable, the work proved profitable. For the present this work has been discontinued and the tailing dumps are held in reserve for future work. This tailing contains about four ounces silver, and $1.20 gold. Since stopping work on the tailing this plant has been operated on Tonopah ore, which runs from $30 to $35 per ton and consists of oxidized ores, carrying 30 to 35 oz. silver and $8 to $10 per ton gold. At present the plant is receiving about 100 tons per day. The method employed is stamp-milling, fine grinding by tube-mills, concentration by vanners and tables, and cyanidation of tailing. The new equipment recently installed for this work consists of 20 stamps, vanners, Wilfley tables, and two tube-mills. Stamps and tube-mills operate in cyanide solution. The material from the batteries passes to tables, whose concentrate product runs high. The middling and tailing from the tables are subjected to fine grinding in the tube-mills, the pulp passing through cone classifiers to the Frue vanners. The vanner product and slime therefrom pass to the cyanide plant, where the sand is subjected to straight leaching in the vats, the slime undergoing leaching by agitation and in vacuum filters. The new equipment has a capacity of 150 tons per day. An aerial tramway, now nearly complete, extends from the railroad in town, down to the plant. This will afford quick and cheap transit for ores from the company's bins at the railroad to the mill.

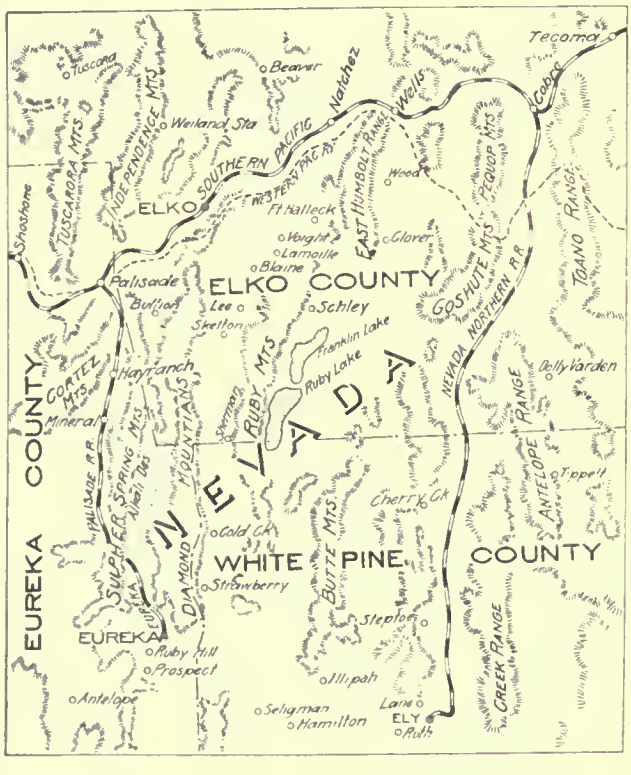
Denver, Colorado.

The Wilfley Mine.—Ore Samples for Schools.—Legislation to Prevent Mining Frauds.—Growth of Public Opinion Against Wild-cats.—The Cripple Creek Drainage Adit.

The recent transfer of the Willley mine at Kokomo to a syndicate provokes more than a moment's passing interest when it is remembered that it was to effect the concentration of the gold-lead-zinc ores of this mine that the owner invented the Wilfley table. The reputation of the table has become world-wide, and the mine still holds its own as a modest producer of wealth.

The Henry Adney mine, at Cripple Creek, has been sold by M. B. Burke to the Equitable Finance & Development Co. Raymond S. Husted has been appointed manager of the property. Several surface improvements will be made in order to increase the shipping capacity of the mine. The shaft will also be sunk to a depth of 1,000 ft., operations at the present time being carried on at the 600-ft. level. This is 200 ft. below the water level of Beacon hill, but this part of the mine has been especially free from water.——A meeting of the Cripple Creek drainage tunnel committee was held on February 21 at Colorado Springs. A resolution was passed to the effect that work should be started at once on the intermediate or Gatch Park tunnel. The assessment work on the tunnel claims is now being done at the portal of the proposed adit. It is intended to use one of the 10-drill compressors belonging to the El Paso Co. pending the arrival of a larger machine from the East.

The smelting plants of Colorado have long been a source of invaluable aid to the mining schools of their own and neighboring States by furnishing checked assay-samples of their ores to be used as test-samples by students. The great convenience of this to the colleges naturally tended to prevent any great effort on their part to render themselves independent of the gratuity of the smelters, and with the passing years the demands upon the metallurgical plants has grown steadily. Finally, an Eastern institution that has recently organized a mining department sent a request for one thousand checked samples; and with one blow slew the goose that so long had laid the golden eggs. The American Smelting & Refining Co. has issued a general order that no more assay samples are to be sent out; doubtless the other plants that have been thus oppressed will not delay in following suit. The schools have only themselves to blame for this development. However proper it may be to obtain, if possible, checked samples to aid in starting a new department, to rely on the smelters to furnish samples continuously, rather than to provide for themselves large lots of ore that will serve for their yearly needs, shows an improvident spirit that is scarcely to be admired.



Map of Eastern Nevada.

The mining fraud bill, which has passed the lower house of the Colorado legislature, and is now before the Senate for consideration, deserves the interest and support of all the serious-minded and honest members of the mining fraternity. The bill in its present form provides that all companies issuing fully paid stock must file with the Secretary of State a complete description of the property thus transferred, giving also the title (whether possessory, fee simple, or leasehold), the name of the party from whom purchased, the actual amount paid, and what proportion of the stock received for the property has been donated to the company. The failure to comply with this law permits a stockholder who believes himself to have been wronged to recover by means of a civil action. The penalty for failure to comply with the provisions of the law may be a year's imprisonment, $1,000 fine, or both. Such a statute would make the operation of the wild-cat promoter much more difficult, and it is to be expected that strenuous opposition to it should develop in certain quarters. Probably the bill will pass, but if it should be defeated in the Senate it is to be hoped that some of the daily papers will be courageous and independent enough to print the roll-call.

The increase of public sentiment against such wild-cat operations is extremely gratifying to all who have the true interests of the mining industry at heart. California and Wyoming already have laws similar in their purport, and have been able to enforce them to a satisfactory degree. Minnesota is urging a law to regulate companies operating in that State and in Nevada; it is proposed to establish a system of district mining inspectors. The mining Provinces of Canada set a wholesome example in this regard. It is most sincerely to be hoped that the final result will be to bring about the extermination of the mining shark, who finds his peculiar habitat in the turbid water of a boom. The mining fraud is a peculiarly despicable kind of a fraud, for in most instances its victims are of a helpless, trusting, and innocent class, such as ministers on infinitesimal salaries, women trying to live on inadequate incomes, uninformed wage-workers, and others struggling against adversity, who deserve to be assisted, rather than preyed upon by sneak-thieves and second-story men masquerading under the guise of promoters. Laws providing for the punishment of such as these can do no harm to legitimate mining, but only aid it, by affording a means of discriminating between the legitimate and illegitimate, removing from the former the cloud of suspicion that often has proved difficult to dissipate.

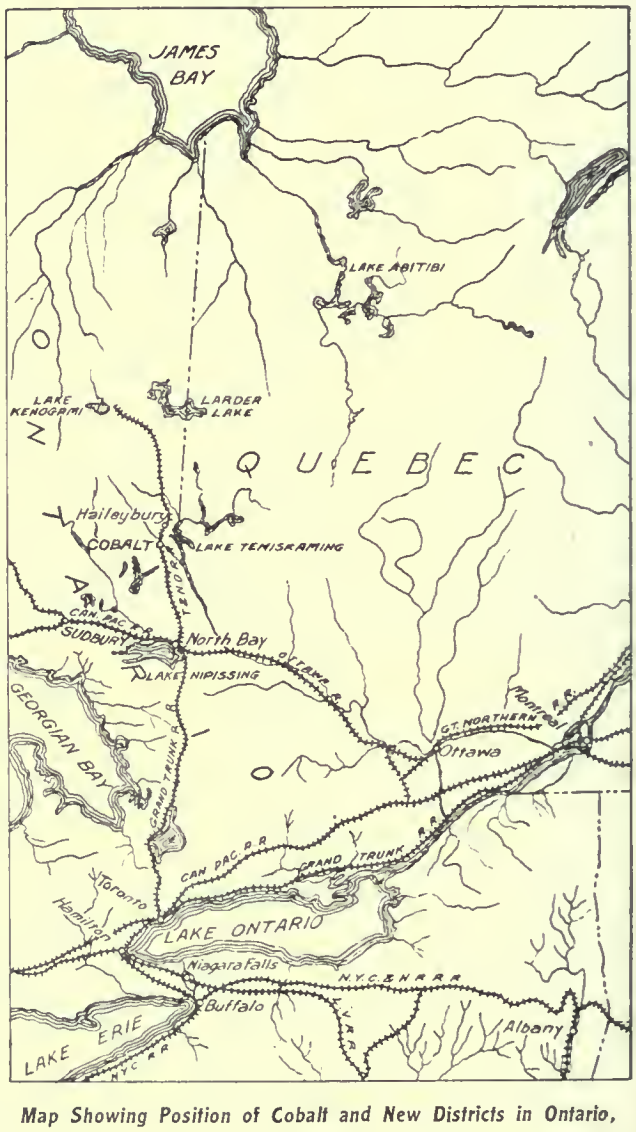
Toronto, Canada.

Shipments From Cobalt.—Annual Output.—Sensational Gold Finds.—New Smelters.—News From Cobalt.—Several Strikes.—Mining Taxation in Ontario.

Shipments of ore from Cobalt over the Temiskaming & Northern Ontario Railways for the week ending February 16, amounted to 187 tons, the following being the shipping mines: Trethewey, 89 tons; Nipissing, 50 tons; O'Brien, 32 tons; Nova Scotia, 15 tons. A report on the present and prospective output of the mines in the Cobalt district by Dr. Eugene Haanel, Dominion Superintendent of Mines, after a personal inspection of the camp made last December, has just been issued. It contains a summary of the ore shipments for 1906, the total being given as 4,584 tons of an approximate value of $4,283,369. The prospective shipments for 1907, from mines at present in operation, is estimated at 12,003 tons of an approximate value of $12,530,152.

Sensational reports having obtained circulation respecting the discovery of gold and silver along the Lievre river, north of Buckingham, in Quebec, Dr. A. P. Low, director of the Canadian Geological Survey, states that the department has received no special information on the subject. A report to the Survey as far back as 1878, records the assaying of a lump of ore, said to be found at Wakefield, 20 miles up the Gatineau, which yielded at the rate of 11 oz. gold per ton; but the fact that it really came from that locality was not confirmed. Since then many samples from that part of the country have been analyzed, in some of which small quantities of gold were found; but in others, none. The Survey officials are not disposed to attach much importance to the reported find, nor to the supposition that gold exists in paying quantity in the Cobalt ores.

It has finally been definitely decided by the North American Refining & Smelting Co., who have for some time been carrying on experimental operations at a small smelter at Hamilton, to build their main plant at Thorold, Ontario, where a suitable site has been secured. They have made arrangements with the town by which the assessment of the property will be fixed at $10,000. The cost of the plant to be erected will be $250,000.——The large smelter of the Montreal Reduction & Smelting Co. at Trout Lake, near North Bay, is nearing completion. It is to be a department smelter and is being equipped with machinery for 12 different processes. In the six buildings erected there is 43,000 ft. of floor space. In the largest of the buildings will be four smelting furnaces each of 250 tons capacity, and a reverberatory. These, it is expected, will be in operation in two months, and later on 10 or 12 other furnaces will be added. Machinery to the value of $350,000 has already been installed. The heavy engines and boilers were made by the Jenckes Machine Co. of Sherbrooke, Quebec, after special designs. Over 1,000,000 lb. of machinery ordered in the United States and Europe is now on the way. The capacity of



Map Showing Position of Cobalt and New Districts in Ontario, Canada.

the smelter is 3,000 tons per day. J. H. Brown of Montreal is manager.

At the Green-Meehan mine, at Cobalt, about 80 men are at work, about one ton of ore being the daily output. The work is necessarily slow, owing to the want of machinery. Boilers are now being transported from Argentine to facilitate operations in the spring. A good strike has been made in No. 3 shaft of the Morrison property, operated by the Cobalt Merger. Development work is being pushed on the properties of the Cobalt Central Mines, Ltd. At the Big Pete the shaft is down 72 ft., and at this level adits 30 to 40 ft. long run into 12-inch diabase, carrying a high percentage of silver. From this mine two carloads of high-grade ore have been shipped. Contracts have been let for sinking four shafts on other properties on which veins have beeu stripped. A power-house is being built for two 150-h.p. boilers and compressors, and a foundation is being prepared for a

concentrating plant to be run by a 100-h.p. engine.——A large slab of practically pure silver, taken from the 135-ft. level of the Nova Scotia shaft, has been brought to Toronto.——The Wabi Cobalt Co. has installed a straight-line compressor with a 3-drill capacity and two 60-h.p. boilers.——Another compressor has been installed at the Buffalo mine, which it is expected will result in a marked increase of shipments.

Strong opposition to the Government's mining taxation policy is being developed. At a meeting of the Toronto branch of the Canadian Mining Institute on February 20, a resolution was adopted, denouncing the measure as opposed not only to the mining, but to the general interests of the Province.

Butte, Montana.

Shaft Sinking by the Butte & London.— The Coalition Co.'s Work. The Big Chimney at Great Falls.— Enlargement of the Smelter. Amalgamated Coke Supply.— Electric Railroad Between Butte and Helena.— The Snowstorm Dividend.— Other News From the Coeur d'Alene.

The Butte & London Co. has adopted the bonus system in shaft-sinking and expects to get good results from it. The average progress made in sinking has been 80 ft. per month, employing 18 men, six on a shift, and paying them $4.50 per day, which is 75 cents per day more than the ordinary wages. The consequence is that the company has been getting the best class of miners and shiftmen. It has now offered them a bonus of $50 for each additional foot over 80 ft. sunk in a month. It is believed that with this incentive the men can make from 90 to 100 ft. per month, and the results will work both ways, that the men will make a good thing out of it, and the company will gain by the decreased cost of sinking. The Butte & London shaft has reached a depth of about 850 ft., and it will be carried to a depth of 1,500 ft. before any cross-cutting is done. Two veins have been cut, and applications have been made for a lease on them, but they were denied, because the company does not want to make any openings on any vein until sinking is completed, lest there should be trouble from water. The prospects of opening a good mine by the Butte & London have been greatly improved by the big strike made in the Berlin claim by the North Butte Mining Co. A vein 28 ft. wide, of which fully one-half is said to be glance that assays 50% copper, has been opened in the Berlin. This vein is pretty certain to strike eastward through the Butte & London ground, according to the best information obtainable.

The recent report that a large vein has been opened in the Coalition's Minnie Healey ground by the Boston & Montana Co. by means of a cross-cut at a depth of 200 ft. below the present workings of the Minnie Healey, is news half a year old. The discovery was made more than six months ago, and was reported at that time in these letters. The Coalition Co. is continuing extensive development work in the Corra mine, the shaft of which is 2,200 ft. deep. Several fine bodies of ore have been opened, and the company is engaged in driving a cross-cut from the 2,100-ft. level north, the intention being to get under the orebodies in the Alice group of mines, now owned by the Coalition.

Work on the foundation for the big smokestack to be erected by the Boston & Montana Mining Co. at the Great Falls smelter has been started, and the stack, which is to be the biggest of its kind in the world, is to be completed in nine months. It will be 506 ft. high above the foundation; it will be circular, in cross-section, and will have a 50-ft. inside diameter at the top, 97 ft. in outside diameter at the bottom, and weigh 16,600 tons. The brick to be used are of perforated radial or segmental form, being made of proper shape to fit the curvature of the circle. The same volume constructed with common brick would require 5,700,000 bricks. One important feature of the chimney will be its sectional lining. When completed this smokestack will have a total height, including foundation, of 742 ft. above the blast-furnace charging-floor, being situated 250 ft. north of the old stack and on higher ground. It will give a draft slightly better than the stack of the Washoe smelter at Anaconda. It will have a capacity of 2¾ times greater than the Washoe stack, and much larger than the present capacity of the smelter requires, but it is the intention of the Amalgamated to enlarge the smelter considerably. The present stack is only 185 ft. high, with an inside diameter of 20 ft. A new flue, 1,800 ft. long, will be built to connect the furnaces with the new stack, and 1,450 ft. of the flue will be 48 ft. wide by 20 ft. high. About 350 ft. of it will be 175 ft. wide by 20 ft. high, this portion being for the purpose of dust collection. The foundation of the stack will be of concrete, 30 ft. deep and 97 ft.

The Coeur d'Alene, Idaho.

across. Preparatory work has also been going on for sometime for the enlargement of the smelting plant. Ground is being excavated for the extension of the reverberatory department, and one of the old furnaces is being removed from the smelter building to make room for the erection of a much larger one. The contemplated enlargement will make it possible to treat about 2,000 tons more ore daily. Should the 'smoke farmers' succeed in closing the Washoe smelter at Anaconda, the Amalgamated would be able to take care of a good portion of the Anaconda ore at the enlarged Great Falls smelter. It is possible that the Amalgamated had such a contingency in view when it decided to re-build and enlarge this plant.

The Amalgamated Copper Co. is conducting experiments with the coal from its mines at Storrs for the purpose of determining whether or not it is suitable for coking purposes, as it is becoming necessary to have a supply of coking coal in the State, instead of depending entirely on Canadian and Eastern points, as at present.

The demand for coke by smelters in Montana averages 1,000 tons every day in the year, while the output in the State, which never exceeded 100 tons per day, has dwindled to almost nothing. Chemical tests of the coal obtained at Storrs have encouraged the Amalgamated officials to believe that the product of these mines is a good coking coal, so a thorough test is being made at Belt. If the experiments are favorable, it is probable that the coking plant will be built at Storrs, and the smelters at Butte, Anaconda, and Great Falls will have a nearer source of supply than at present, while the cost of the coke will be lessened by the shorter distance covered in its transportation. The smelters of the State have been running short of coke for some months, and the supply has been very uncertain. Some of the smelters were not able to run full time because of the coke shortage during the past three months.

It is probable that the proposed electric railway line between Butte and Helena will be built. All the stock necessary for preliminary work has been subscribed. F. Augustus Heinze is largely interested, and the project is considered favorably by local mining men. It is proposed to tap several mining districts between Butte and Helena, and also to build a large smelter on Lake Hauser, near Helena. It is the intention to run ore-trains from Butte to the Helena smelter and make a market for the surplus ore, and also make it possible for small producers to get a better smelting rate than they have been getting. The company is to be known as the Helena & Butte Electric Lines Co., and is to have an actual working fund of $2,500,000. Many good mines and promising prospects are idle in the districts between Butte and Helena because of a lack of transportation facilities, which the proposed road will supply.

The Snowstorm Mining Co. has declared a dividend of $45,000 for February, being the second dividend of that amount since October. The company is capitalized for $1,500,000. The February payment is the beginning of what was expected to be a regular monthly dividend, though it is not certain that one will be declared in March, owing to the fact that bad weather tied up operations for 15 days at the mine, and also blockaded traffic on the Northern Pacific railroad so that no ore could be transported. At the time the dividend was declared there were 190 cars of ore on the tracks awaiting transportation to the smelters. It is reported that the property is in better condition than ever, and that the ore-bodies are developing satisfactorily with depth. The west drift on No. 3 level is expected to break into the orebody very soon, as the entire face is well sprinkled with ore. A contract has been awarded to a drill company to do 4,000 ft. of exploration work to the east of No. 3 adit. Four different bores will be made, one to the length of 1,200 ft., and the country east of the fault will be thoroughly explored. W. D. Greenough, the manager, believes that the work of the diamond-drill will result in finding the orebodies and making the development work more certain.—— Another strike has been made in the Stewart mine, another Cœur d'Alene property, under the control of F. Augustus Heinze. The Stewart is situated near Wardner, and Mr. Heinze secured control of it several months ago by taking an option on 700,000 shares of stock at 40 cents per share. The strike is the second made in the property since Mr. Heinze has been doing the exploration work, and he has announced that he will take up the option when it becomes due. In the course of development work thousands of tons of ore have been taken out and are on the dump, but under the terms of the option this ore cannot be shipped. It is stated that Mr. Heinze has plans for the erection of a concentrating plant on the property.—— The recent work done in the famous Bunker Hill & Sullivan mine at Wardner indicates that the Cœur d'Alene lodes persist in depth. The ore-shoot has just been cut at a depth of 3,000 ft. on the dip, and it is claimed that there is $25,000,000 worth of ore assured.

London.

Good News from Dolores.—Siberian Mines.—Lots of Pups.—Legal Requirements in Siberia.—An Alluvial Enterprise.—Copper in Caucasus.—South Australian Mines. Death of Thos. B. Bewick.

The Dolores (Mexico) appears likely in the near future to outstrip its milling capacity. A study of the reports shows there is the probability of a new ore-shoot north of the one opened up. According to a statement issued this week by Dolores, Ltd., the manager has hopes of finding two veins going down from the 3rd level, where only one was supposed formerly to exist. Then there is the old San Francisco vein, toward which a cross-cut is being run from the 3rd level, with about 100 ft. more to drive to intersect the vein. Now comes the news that a 'rich strike' has been made in the front of this cross-cut four feet wide, assaying $45 per ton, besides a thin streak running to $280. The statement refers also to the slowness of development work generally in the mine as arising from lack of transport for wood fuel, this having put the air-compressor out of work. Regarding the mill, the consulting engineer, Mr. Geo. A. Schroter, states that the plant is treating 50 tons per day by cyaniding. They have been able to bring the mill up to this capacity by utilizing the sand plant, which has been put into commission, and also by utilizing the pans for fine grinding. Mr. Schroter says this is a make-shift, pending the arrival of the new tube-mill. From the surplus accumulated last year and the current profits, it is thought Dolores may be expected to pay quarterly dividends this year at the rate of 20% per annum on the increased capital—£396,000.

The latest circular of Siberian Proprietary Mines Ltd. has not had the effect of restoring the stock of the parent company and its subsidiaries in public favor, although the bottom in prices appears to have been reached for the present. The circular states that it is wholly inaccurate that the company has registered six additional subsidiaries, each with a capital of £100. It is equally inaccurate that the Proprietary Company has off-loaded its Troitzk Goldfields shares at exorbitant prices. The Proprietary Company's original holding of 251,000 shares has been neither added to nor diminished, nor is there any intention of dealing in any way with this interest. The statement that another property was substituted for the one which formed the substratum of the Proprietary Company is altogether without any foundation, the property in question being the one which has been purchased outright by the Troitzk Goldfields. The lease and option to purchase the property that the Orsk Goldfields was subsequently formed to acquire was obtained by the Proprietary Company in the ordinary course of its business. In this case also the Proprietary Company retained a majority holding of 251,000 shares, which has been neither added to nor diminished. With the exception of the transactions stated, the Proprietary Company has not in any way dealt in the shares of either of its subsidiary concerns. The present available cash resources of the company are about £215,000 (mainly from the recent issue of new stock at a big premium), the whole of which is employed either on bank deposit or in short loans upon gilt-edged securities. The issued capital of the company is £116,000. There is not at present in Russia a law relating to joint-stock companies which is general in its application, and the process of complete legalization takes

some little time. The authorization is already complete in the case of the Orsk Goldfields, and completion in the case of the Troitzk Goldfields may be shortly expected. Meantime the returns from the Orsk mines continue to be of a meagre description. The manager reports that in the month of December, 1906, 1,263 tons of tributers' ore yielded in the mill 696 oz. retorted gold; also, during the same period, 30 oz. alluvial gold were obtained from the Suvunduk and Siberian claims. The total revenue to the company from the tributers for this period, after deducting the working expenses of the mill, is estimated at £1,181. It should be noted that during this period, as in previous months, there were only 24 working days. Permission, however, has now been obtained from the Russian Mining Administration to work the mill throughout the year, Sundays and holidays included.

At the statutory meeting of the Kaneika United Goldfields, Ltd., a company which has no connection with the Siberian Proprietary group, and which must be considered as on an entirely different footing as regards its inception and management, the chairman, Mr. H. D. Boyle, in the course of a lucid address, made a statement clearly setting forth his company's position as to titles. The particulars are of interest to would-be owners of mining property in that part of Siberia. He said: "With regard to mining properties on the steppes, where our properties are situate, in order to enable such properties to be worked, and the full benefit thereof to be secured, three things are necessary: Firstly, a transfer of the properties from the owners, whose title has to be investigated; secondly, after such transfer the deed of transfer should be registered with the mining officials of the district; thirdly, under a local regulation passed in 1902, and which was passed with the object of preventing mines which were close to the Chinese border being acquired by Chinese subjects who had not sufficient capital to work them, a formal permit should be obtained to work such mines." Undeterred by the slump in Proprietary flotations, strong groups in London are engaged in the examination of gold mining properties in Siberia, one or two of which at least appear to be of a decidedly attractive character. According to rumor, one of these, situated to the north of Lake Baikal, is shortly to be placed on the London market under sound auspices. The mine in question is said to be a gravel deposit of great extent, worked by a Russian company of good repute for many years with highly satisfactory results. The development is reported to be well in advance of output, the net value of ore 'in sight' being stated at between one and two million sterling. Supposing the facts to be approximately near the figures shown to a chosen few who are invited to come in to the deal on bedrock, the formation of this company should go a long way toward rehabilitating the position of Siberian enterprise, which, it must be owned, badly requires a stimulus just now. In another part of the Russian Empire considerable attention is being given to copper mines, the import duty enhancing the value of the metal by some $160 per ton, being a favorable feature. In this connection the Caucasus Copper Co., Ltd., is likely to give a good account of itself before long, after several years of uphill work, the difficulties having been accentuated by incompetent management during the early stages. Although the expenditure has reached a sum of close upon half a million sterling, the production of copper has not yet commenced. Judging from the latest reports, however, the 500-ton plant, erected under the supervision of American engineers, is nearing completion, and the company will be in a position in the spring to begin turning to profitable account the 3,600,000 tons of ore said to be actually 'blocked out.' Besides these resources for a large output, the mine is considered to have additional possibilities as the result of further important developments over a large area of productive ground. The company has enjoyed the support of such princes of finance as the Barings and Morgans, and the rich experience of the United States has been drawn upon, in the designing of the treatment plant, which includes a magnetic process for the recovery of copper, said to have been in operation for some time in America with complete success on a commercial scale. The mine is 40 miles from the port of Batoum by road, the oil for fuel purposes being conveyed thence by pipe-line.

South Australia, which is credited with an output of copper to the value of over twenty-two millions sterling, is again coming to the front as a producer of the metal consequent on the improvement in price. Among the properties introduced to the London market from this part of the world, the Union Consolidated Copper Mines of South Australia has been able to take a prominent place. When it first made its appearance some remarkable estimates of the value and possibilities of the company's property were put forward, officially and unofficially, and according to accounts these are being borne out by developments. The outputs during six consecutive weeks to the end of December are reported to have risen from 225 tons to 1,150 tons, separate parcels of ore averaging from 6 to 40% copper. Through the acquisition of the Daly mine, which has an area of 80 acres, the company obtained a sixth lode, and it is stated that immense bodies of highly payable ore are being developed on this and lodes No. 4 and 5. The lodes outcrop boldly, the No. 5 main outcrop being about 2,500 ft. long, averaging 200 ft. in width and 100 ft. in depth, while the No. 6 is 2,400 ft. by 100 ft. by 350 ft. The smelters belonging to the company are inadequate for the treatment of the quantities of rich ore that are reported to have been opened up, and arrangements have been made with the Tasmania Copper Co. whereby they agree to erect, at their own expense, a plant capable of dealing with 3,000 tons weekly of the Union Consolidated Co.'s ore. Taking this quantity at 6%, the annual production of copper would amount to 9,000 tons, of the value of nearly £1,000,000 on the basis of the present price for the metal. The working costs are estimated not to exceed 50%; on the contrary, it is supposed they may be much less, as huge bodies of the ore are to be mined by simple quarrying. The Union Consolidated Co.'s mining area covers a trifle less than a square mile, and in view, also, of the extent of the property a subsidiary company has been formed. This is called the Lyndhurst Copper Co., having a nominal capital of $200,000, the shares of which are now being introduced on the market, and it takes over the No. 6 lode entirely. The latest output from this lode is reported to have amounted to 550 tons of 7% stuff.

The sudden death from a broken blood-vessel, is announced of Mr. T. W. Bewick at the age of 50. Men of the last generation will recall the stalwart genial presence of his father, Mr. Thomas John Bewick. In those days the names of Bewick and Sopwith stood for all that was best, more especially in lead mining and smelting. In these days the firm of Bewick & Moreing is no less known the world over, in a much wider sphere of operation as a leading—if not the leading—firm known to English mining engineers and investors, comprising in its members thoroughly up-to-date and successful men in all branches of the industry. The head of the firm, Mr. C. Algernon Moreing, naturally feels keenly the loss of an old partner, as well as a friend and companion from the time when as a young man he joined hands with Mr. T. B. Bewick under the guidance of that gentleman's honored father.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

'BORRASCA' is the reverse of 'bonanza,' and is used to describe a mine which has a vein, but no ore.

A HEAD of water is the service from which hydraulic motors derive their energy; these motors are the most efficient of all prime movers, utilizing about 80% of the units of work stored up in the head of water.

GILSONITE and elaterite are asphaltic minerals that are found chiefly in Utah and Indian Territory. They are mixed with other asphalts, and are used for street paving. The price varies between $30 and $45 per ton.

LOOSE aggregates of rounded and water-worn pebbles and boulders are called 'gravel,' and when they become cemented together into coherent rocks, they form 'conglomerate.' Silica, calcite, and limonite are the commonest cements.

'LACCOLITE,' a name based on the Greek word for cistern, was suggested by G. K. Gilbert for those intrusions of igneous rock that spread out laterally between sedimentary beds, like a huge lens, and that never reach the surface unless exposed by erosion.

A 'WHIP' is a pulley erected over the shaft, the hauling rope passing underneath a second pulley at the surface, and being drawn by a horse walking along the ground. This appliance is most advantageous in sinking prospect-shafts to a depth of from 100 to 200 feet.

THE treatment of serious burns received around smelters, etc., includes generous applications of carron oil, a mixture of linseed oil and limewater, or a solution of sodium bicarbonate. The affected part should be covered with antiseptic absorbent gauze, kept in place by bandages.

HORSE-POWER is the standard for computing the work of living agents, as well as work done by steam engines. It is customary to use 33,000 units of work as an equivalent for one horse-power, but the work of an average draught-horse is more nearly represented by about 22,000 lb. raised one foot in one minute.

TIMBER used for underground supports should be long-grained and elastic, and at the same time light. Oak, beech, and similar woods are strong and durable, but are heavy to handle, and when once they take weight, are treacherous, as they break without warning, being short-grained and inelastic. Pine and fir are good mine timbers.

RAILROAD CURVES are simple, compound, or reverse. Simple curves have but one radius, a compound curve is continuous and has two or more radii, and a reverse curve is a continuous one composed of arcs described in opposite directions. These curves are designated by the number of degrees in the angle at the centre, subtended by an arc whose chord is 100 ft. long.

A COMMON LUBRICANT for wire rope is a mixture of Stockholm tar, tallow, and resin. It is a poor substitute for pure mineral oils or greases, because the tar always contains acetic acid; the tallow becomes rancid, and then contains free organic acids. The Stockholm tar is the worst ingredient, for it sometimes contains as much as 10% acetic acid. Good lubricants are plentiful, so that this home-made mixture had better be discarded.

HIGH-GRADE FUORSPAR is used for the manufacture of opalescent glass, for agate enamels, and the production of fluorine chemicals. Poorer grades find use in the manufacture of open hearth steel and in foundry work. The use of this material in foundries is much less than it ought to be, on account of lack of knowledge regarding it. Extra clean castings are made with its use.

ON THE BASIS of equal weights, sodium, calcium, potassium, aluminum, and magnesium all exceed copper in their relative conductivity. The conductivity of sodium is three times greater than of an equal weight of copper, but it must be protected from air and water, which can be accomplished by filling wrought iron pipes with molten sodium. The cost of a sodium conductor made in this way would be less than half that of an equivalent one made from copper.

A THREE-COMPARTMENT vertical shaft was sunk at the Helena-Frisco mine at Frisco, Idaho, from the 600-ft. to the 1,600-ft. level, in 516 days, at a cost of $59.52 per ft. for labor, material, and supplies. The labor account showed a total of $43.10 per ft., and the total for supplies was $16.42. The chief item, of course, was the labor of sinking, amounting to $28.69 per ft., while the labor for timbering was next, being $5.20 per ft. Fuel supply cost $4.92, and timber $4.64 per ft., powder $2.82, and fuse $0.66 per foot.

IN DRIVING a tunnel of a large size the American centre-cut system of drilling holes has been found efficient, using air at 160 lb. pressure. In this system, the plunger and cut-holes are fired first, then the side and back-holes. The cut-holes require about 100 lb. of 60% gelatine powder, and the side and back-holes from 50 to 70 lb. of 40% gelatine powder. It is not necessary to tamp the holes, and the round can be cleanly broken with from 100 to 170 lb. powder. Tunnels have been driven in this way at a total cost of $28 per foot.

THE VEIN of metallic arsenic one metre wide in Mexico ought to be worthy of exploitation; the operator should balance his costs of mining, freight, and treatment against the market price. White arsenic (arsenious oxide) is worth from 3 to 3½ cents per pound. Most of the arsenic produced in the United States comes from the Everett smelter, which treats the arsenical pyrite of the Monte Cristo mines in Washington, and the Anaconda smelter, where the flue-dust from the furnaces is collected, and the arsenic oxide separated, to be refined previous to shipment in barrels. In 1905 the United States produced 1,545,000 lb. white arsenic, an increase of 55% over the production of 1904.

SCHEELITE, the tungstate of lime, can be treated directly in the electric furnace, together with iron ores, for the manufacture of ferro-tungsten. The lime is valuable as a flux to combine with the silica in the ore to form slag (the preparation of sodium para-tungstate suggested by an enquirer is undesirable). If the ore be associated with quartz, a concentrate could be made and the residual quartz would readily combine with the lime. Any excess of sulphur as sulphide should be avoided, though as much as 2% sulphur is not detrimental, as the de-sulphurization will be complete before the complete reduction of the iron is finished. The cost of a small electric furnace for the manufacture of 20 to 30 tons of ferro-tungsten per day, should not exceed $5,000 to $10,000, exclusive of power plant.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Comedy in Three Parts.

The Editor :

Sir—Some time ago I had three reports on a tin proposition submitted to me by prospective investors, requesting that I examine same for their account. One of the reports was from the inspired pen of the promoter, another was from a "practical" miner, and the third from a "well-known" mining expert, so the promoter said.

After reading the three reports carefully, I had to recommend that no further attention be given to the property, for I did not wish to be the means of bringing a property into being, that in all probability would glut the market with tin, causing heavy losses to existing industries. As these papers are unique and interesting, I take pleasure in sharing them with the profession at large; and then, they may serve the younger members as models—to be avoided.

Of course they are compiled, but what extracts are given, are verbatim, the orthography and construction being unchanged.

The promoter said:

"I cannot go into details of the geology; the lodes are too great and valuable. To see them, staggers the intelligent observer, to catalogue them is impossible. The mine is in the midst of a mineral belt containing some of the greatest tin deposits of all history. The predominant out-cropping in the mineral belt on which this group is located, is an andesite,—an igneous rock of an acid type, and of a comparatively late period. These flows cover rhyolite flows of an earlier period, and are in turn cut by basic of an earlier period than themselves. Then I find all this strata lying between green stone and synite granite, carrying more or less tin, or give evidence of having been through the rocks at some earlier period. These latter, undoubtedly, had some considerable influence in the formation of tin deposits, causing by their intrusion stresses, which resulted in a strong fissuring and breccation of the older andecite flows. These lodes follow the general direction of the uplift. These facts indicate that the vein is a true fissure. The dip is toward the East and is almost vertical; this is important, for as a rule, the veins are richer when nearer vertical. The ore chutes dipping to the East. The line of fissure is marked by more or less gossan.

The developments are exceedingly meagre as yet, and consist chiefly in building roads in to the property, and trails up to and around the vast tin deposits, standing in evidence developed by Nature. There are millions of tons of ore in sight. Nature has placed her sign-board pointing to the hidden wealth. My advice is, that the seeker for these treasures follow the path she has marked out. All needs be done is quarry down the mountain of ore. While I cannot estimate the tonnage in sight, I can truthfully say that it is almost beyond figures.

There is a cross-cut tunnel forty feet, all in ore. The ore, from assays, runs about 4% tin; also a small amount of gold and silver. We have verified the correctness of the theories of mining experts in this district, that the lodes increase in richness as they descend. With greater depth in to the mountain, the gold values will increase. Here the great values of the mine will be found. You could work almost a life time on the ore in sight and scarcely make an impression on the vast tonnage.

The general impression that the miner is oversanguine and visionary and impractical, is not sustained by facts; he sees the harvest as clearly as the farmer, but a narrow skepticism would prevent either from reaping. Mining has passed a long way beyond the stage of experimentation; the trained eye here discovers the ore, and experience, skill and science find a larger field in mining than in almost any other calling of life."

The "practical" miner said:

"At a point quite a distance from the foot of the trail—perhaps a mile from the river—brought me to the southwestern boundary of eight claims. From this place, a deposit of ore, which nature itself has developed, stands forth full in sight and can be traced through the entire location in a south-western and north-western direction, with an inclination of a few degrees to the northwest, while it runs up through the mountains to an unlimited height. This massive deposit seems to have sections or lodes, side by side, with ribs of silicious spar running parallel throughout. Taking the width of the whole body, it will measure more than five hundred feet.

As I have tried to give you a glimpse of its dimensions, I will now describe the nature of the ore. The gross body is a micaceous iron. Although much of it has a bluish-black appearance, still it may be protoxide of iron. Its specific gravity is great, and where mica less abounds it is brighter and heavier. And whether broken from surface rock or taken from under cover from one of the prospect holes, its character is the same.

From those claims, I brought away many pounds of ore from various places, and have compared the pieces carefully as to their relative affinity, while at the same time I have aimed to find from each something new in itself; i. e., the grain of lamella, the dull or glittering, the light or heavy weight, and with a greater ardor still, to find some deeper hues of oxides with the existence of richer ores. Having spent much time over this, I, at last, found some cassiterites of tin; and after making many water tests as to the existence of such, resolved to have it assayed. The result was 3.9/10% tin; Gold, $1.12; Silver, 11 cents per ton.

For sometime I found great difficulty in bringing the cassiterites to the head of my washings, and from the practical knowledge of tin dressing, I eventually overcame such. And using as a comparison, tin ores from Old Mexico and from Cornwall, England, and some from the noted Temescal mine, and other pieces from the tin properties of Southern California, it assisted me greatly in their relation to concentrate my researches to the feasibility of produce. While experimenting on the different kinds or quality of rock, as to its degree of value, and from some places of its great deposit, I can find ore that will yield a result of not less than 8% tin.

Having shown forth in few words the dimensions of this tin property of 180 acres, and the test of its value, so far as specimen of assays demonstrate, I will now add my opinion, or as it may appear, advise, pertaining as to the best method that can be used in order to prove whether it can be made a commercial enterprise.

For many years the southwest has been in this great research, not merely from any suggestion, but from the knowledge of the existence of this valuable ore, insomuch that produce has been the result of efforts made in one or two instances; and now, at the present time, tin worth nearly $600 per ton, and the United States of America uses 60% of all the tin that is produced. Therefore such promulgation strongly favors the impetus for such aggrandizement.

From other information in conjunction with my own work, I will say that the only proper thing is to give this ore a commercial test, i. e., take a quantity of many pounds, crush and dress it according to the discretion of those who rightly understand their work. Let it be treated in such a manner as though it were a hundred

tons. They, of course, will observe the specific gravity of it, and also the size of fineness to which it has shaped itself; knowing it is impossible to dress tin ore from one common concentrator. I am not able in this short report to give an idea of the many ways in which the tin is saved; only to impress this: that in such ores as our southern deposits of micaceous substances, it will necessarily require a graceful motion of flow, instead of heavy force of water.

My latest investigation of the Cornish tin dressing has opened my convictions, that while we seek but little or no aid in the pursuit of mining in general, we yet may submit to one favor at least from those who have had an experience handed down from thousands of years. So in conclusion, I will repeat my words, that this is the only advisable method that I can give you whatever."

The "well-known" expert said:

"The structural geology of the property consists of a number of contorted anticlinal folds, with a general trend from East to 22° North of West and with a general elevation above sea-level (mean datum) ranging between 1861 to 2388 feet.

The lithological character of the rocks exposed consists principally of Hydrous rocks of the lower Cretaceous epoch down to the older and more silicious Bisilicates.

The surface rocks are for the most part nonconformal and as a rule carry no values, and for this reason, the development should be confined to the lower levels and the northeasterly strikes, for the present, as the more conservative proposition. Develop the brown, black and yellow granular ores only as they will give the best returns and generally prove the most satisfactory.

Formula for Smelting—first concentrate and take 1 part ore, 2 parts soda (carbonate), 3 parts cyanide of potassium, 3 parts of blacksmiths' coal and saturate the whole with crude petroleum and smelt.

With a careful study of this ore and a frequent test of the samples as the development progresses, you will soon become familiar with the best class of the cassiterite ores and the other details necessary to successful operation.

Taken as a whole, the property looks promising, and we feel warranted in recommending it for a thorough exploration on conservative plans, using good judgment and careful consideration under all conditions."

Are these to be considered parts of a comedy or do they presage a tragedy?

E. A. H. TAYS.

San Francisco, February 10.

Deep Level Development on the Rand.

The Editor:

Sir—From news lately received from the Rand it is reported that a commission has been appointed by the Government to enquire whether the section at present standing in the Mining Regulations and which calls for the sinking of two separate shafts for each separate mine is, or is not, necessary.

The significance of this to shareholders in 'deep level' companies, may not be immediately apparent, as it is somewhat of a technical nature. It should, therefore, at once be explained that the cost of sinking a single shaft to depths of several thousand feet, requires an enormous expenditure of capital, amounting frequently to from £100,000 to £200,000. It is, therefore, at once evident that should it be found that this large expenditure of capital is required in the sinking of only one instead of two shafts, 'deep level' companies should occupy a far better financial position than they do at the present time.

Under the English Coal Mines Regulation Act, two shafts or outlets to any colliery are required in case of accident, as they are subject to explosions of gas, and many years back a terrible accident was caused, resulting in the entombment of a large number of miners, through breaking of a large pump-beam working over the shaft, which falling, dragged in the sides and entirely blocked it up.

Now, as it is well known the Rand gold mines are not subject to such disabilities—there being no gas, and heavy Cornish pumps are not employed—therefore the only other question that need be considered, is, whether an adequate supply of good air for the miners is available through a single shaft; this can be done easily by means of a partition and the employment of mechanical ventilators or fans.

It is further argued, that in most cases an additional outlet of escape for the miners, in case of any temporary accident to the single shaft, can usually be effected by connecting adjoining 'deep level' areas underground by means of drifts; and this could be carried out at a comparatively small expenditure of capital. Thus the cost of driving such ventilating levels would probably only be some £5 per foot, whereas the sinking of a shaft might easily amount to £25 or £30 for every foot sunk.

In view of the great shortage of available unskilled labor on the Rand, 'deep level' companies might easily hesitate to face the great expenditure entailed by the sinking of two distinct shafts, say, with equipment, running into half a million sterling, as after sinking the shafts it would then become necessary to employ a much larger number of unskilled natives or Chinese to carry out the further necessary underground development work. If, however, this commission decides that 'deep level' companies can be safely worked by means of one shaft, then doubtless the directors of such concerns will give the word to start sinking operations on many properties, which are now either only sinking one shaft, in a half-hearted manner, or in which no sinking work whatever is being done, while a large amount of capital is locked up, and is not paying any adequate interest to shareholders.

Those who are following the political situation, now being fought out in the Transvaal and have read the speeches of the candidates, must be convinced that nearly all of them seem to be of the opinion that Chinese labor must at least be retained, (another ordinance being passed to permit of it) until such time, at least, as some fit substitute has been found to take its place.

There are many who feel assured that finally even the Boer will not object to the employment of Chinese labor, as long as it is confined to mining on the Rand and that by its employment a certain number of the natives may be set free from the mines to help in the agricultural development of the country, especially if the Boer gets his way in education and other matters. In this manner it may become possible to so reduce the cost of living as to permit of the generous employment of unskilled white labor.

With the solution of these great economic problems, no one can doubt that there will be renewed prosperity on the Rand and now that so many proofs have been given of the continued richness of the areas to be developed by the 'deep level' companies, there is every hope for the shareholders in such concerns finally emerging with the same big profits that have accrued to many of the 'outcrop' companies.

EDGAR P. RATHBONE.

London, February 8.

BELTS generally run toward the tight side of the pulley. This is true of vanuer belts, but not of elevator belts, which run toward the loose side.

Deep Mining in the Lake Superior Region.

By F. W. McNair.

*The copper mines of the Lake Superior district are essentially low-grade. Their profitable operation is made possible by the great extent of the lodes, their comparative uniformity of character and the investment of great sums of money to maintain operations on a vast scale over a long period.

With but one important exception, the lodes are the vesicular tops of ancient lava flows that, subsequent to solidification, have had the cavities wholly or partly filled by the deposition of various minerals, among which is native copper. They dip at angles varying from 38 to 70°.

The modern shafts through which the ore is hoisted are either inclined, following the plane of the lode, or are vertical. Several of the inclined shafts are over 5,000 ft. long. One has a length of 8,100 ft. Of the vertical shafts

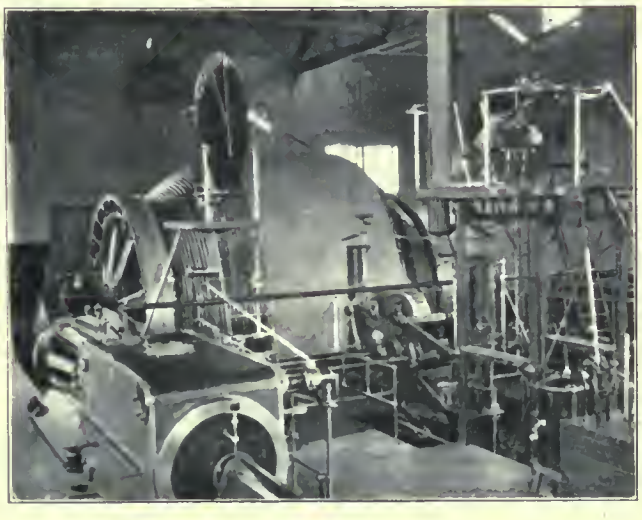
Head-Sheaves at Trimountan No. 4 Shaft.

the three deepest are, respectively, about 5,200, 5,000, and 4,900 ft. deep.

Long before such depths were actually reached there arose the question as to a possible limit set by the ultimate crushing strength of the rock penetrated. Manifestly, mining cannot go to a depth such that the weight on walls of drifts and stopes will exceed the ultimate strength of the material of which they are composed. There is a widespread impression that the Lake mines are approaching such a limit. There are current statements to the effect that pieces of rock occasionally snap off the faces of the workings because of the great strain, and are violently projected as if propelled by an explosive.

In this connection a few figures will be of interest. The average density of the rock of the copper-bearing series is not far from 2.87, that is, a cubic foot weighs about 179.3 lb. Therefore, a horizontal square foot of area at 5,000 ft. from the surface has above it a column of rock weighing 448 tons. The ultimate crushing strength of the average rock is not well known, but since it is mostly trap this may be safely assumed as at least 1,200 tons per sq. ft. If, therefore, the square foot as defined carries the entire column above it, it is loaded to much less than half the crushing strength, and only at nearly three times the assumed depth will the load reach its crushing limit. At a dip of 38°, the pressure normal to the plane of the load at 5,000 ft. from the surface is only 354 tons per sq. ft. It is in this direction that the crushing forces are mostly called into play. As the dip increases this normal pressure of course diminishes. At 52° it is 278 tons, and at 70° it is 152 tons per square foot.

However, the matter does not end here. The removal of large portions of the copper zone leaves considerable areas of the roof or hanging wall to be supported by the pillars that are left for the purpose, or by the walls of the opening, or by both. The weight on pillars and walls is thus increased and may easily approach the crushing limit. Take, for example, a long pillar 50 ft. wide having on either side an open space of 150 ft. Suppose it in a lode dipping 38°. Allowing for neither rigidity nor arching, and supposing the weight on the pillar evenly distributed, at 5,000 ft. deep it would be subjected to a pressure of 1,239 tons per sq. ft., a pressure under which it would fail.



Nordberg Hoist at Trimountain No. 2 Shaft.

As a matter of fact, in such a case the rigidity of the mass distributes a large part of the load out over the rock beyond the walls of the opening. That this rigidity may be considerable is illustrated in several cases where areas of hanging as wide as 200 ft. or more have no support between walls, and yet have stood up for several years. They are not, however, at maximum depth.

In such an area a pillar when first cut out may have to carry but little more than its previous load. As the hanging wall slowly bends the pillar must take up more and more of the extra weight. This is not applied uniformly. As the rock between pillars and walls bends downward the tendency is to concentrate the load at the edge or face of the pillar, or wall, much as a beam does when supported in like manner. The outer parts of the pillar may thus become overloaded and here it will fail. It does so by the splitting off of pieces of rock, much as may sometimes be observed with a specimen in the testing machine, though on a much greater scale. These pieces break from the base as well as the top, and, as a rule, like any hard rock, under a crushing load, the pillar fails suddenly. Small pieces of rock may fly to a considerable distance, and such occurrences have undoubtedly given rise to the exaggerated impression of the compressive stress to which the rock is subjected in the lowest levels.

The hanging rock mass moves, of course, when the pillar crushes, and the vibration due to the sudden though

*Abstract from address before American Association for the Advancement of Science, as published in *Science*. The illustrations have been added.

slight displacement is often conveyed to the surface. The result is a miniature but perfectly genuine earthquake that may be felt over a distance several times that of the pillar from the surface. With the crushing of the pillar and the movement of the hanging, a re-adjustment of the weight takes place, and the process begins over again. Instead of the process being repeated exactly it is possible for the hanging to break in such a manner that the arching effect may protect this pillar, and place the load on others. Eventually, at great depths the hanging and foot must come together, and in one mine the final steps in the process came so rapidly as to completely wreck it.

The pressure normal to the plane of the lode is not the only action that may appear. The pillars are not, as a rule, separate from either foot or hanging. They are parts of the same rock-mass, and it is not possible for the hanging to slide over the pillar. In consequence, the re-adjustments that take place when a pillar fails as above described, sometimes put an enormous longitudinal thrust on the foot, and in places its surface portion has buckled up under such stress. Also, at points where shaft-pillars have been weak, shafts have been pinched and twisted under the same conditions so as to interfere with their operation.

Experience seems to show that at the great depths recently reached it is useless to expect to hold up the hanging rock-mass for a long time by any scheme of pillars unless far too much of the lode is left in place, and that the only feasible method is to cut away the entire lode and permit the hanging to cave as rapidly as it will to the point where the broken rock fills again the whole space, and re-distributes the weight over the foot-wall. Following this plan, stoping begins at a point farthest from the shaft, and progresses toward it. With a wide shaft-pillar, or with the shaft in the foot-wall, and with some such general method that avoids concentration of pressure where it can do harm, there seems no reason to anticipate serious difficulties due to crushing for a further depth at least as great as that already attained.

The difficulties of surveying the mine are not markedly increased by depth, except in the cases of vertical shafts. When these are deep, and it becomes necessary to carry down an azimuth from the surface by means of two plumb-lines hung in the shaft, there is presented a problem of considerable difficulty. It is almost impossible to free the lines entirely from disturbing influences that displace them from their normal positions. If either lines or plumb-bobs are of magnetic material the presence of iron pipes in the shaft may result in seriously disturbing them. Falling water may be in such quantity and so directed as also to affect the position of the lines.

However, the air currents, which cannot be wholly eliminated, whatever the precautions taken, are the most serious cause of disturbance. The temperature at the bottom of the shaft is higher than that at the top, and in consequence convection currents are formed. The heat supplied from the surrounding rock keeps them up. Indeed, with moderately steady temperature at the surface, and with the shaft idle, a remarkably stable condition of these air currents may come about. Elsewhere observations have been published by the writer,[1] showing that their effect on a plumb-line may remain sensibly constant for hours at a time while deflecting the line from its vertical position. The stability of the currents is made possible by the large cross-section of the vertical shafts, 10 by 22 ft. to 10 by 30 ft. outside of timbers, thus giving a large air-body, and the constancy of the rock-temperatures, and the supply of heat through the shaft-walls. When we take account of the fact that a force equivalent to a horizontal pressure of 10 grains on a 60-lb. plumb-bob suspended by a line 4,000 ft. long will displace the bob one-tenth of a foot from its normal position, it is easy to see how apparently slight causes may produce appreciable error in azimuth.

General attention was first attracted to this problem by the noticeable divergence of two long plumb-lines hung in shaft No. 5 of the Tamarack mine. Of course, divergence alone would not affect azimuth, but the question confronting the surveyor is whether the divergence may not be due to some cause that may also displace one or both of the lines in a direction perpendicular to their plane. In the case mentioned it required a great deal of investigation and experiment to fasten the responsibility on the currents of air.

It is remarkable how many persons are ready to accept as an explanation of such divergence the statement that there is an excess of gravitation on each bob horizontally toward the end wall nearest to which it hangs. All are familiar with the picture in the text-books of the plumb-line hanging near the face of a precipice being deflected from the vertical by the attraction of the mountain mass. The idea so strikingly conveyed by this picture, while qualitatively correct, seems in most minds to be quantitatiyely wrong. There is an excess of attraction on the bobs as stated, but its amount is far too insignificant to account for any observed divergence. At Tamarack No. 5 it could account for no more than one one-thousandth of a foot. The convergence of vertical lines in that instance is over three times this amount.

Increased depth tends to lessen the output of a given shaft, and in the effort to prevent this, and also to reduce hoisting charges, loads have grown larger; likewise the speed at which they are hoisted. Loads of nearly seven tons are being raised on some of the inclines at speeds up to 40 miles per hour.

A considerable item in the hoisting charges is the cost of maintenance of the skip-road, the expense per ton for this purpose increasing with the length of the shaft. The usual skip-road is carried on heavy timbers that are placed transversely along the foot, and support large stringers to which the rails are spiked. The expense of maintenance of this road for great depths is such that some of the mines are substituting for it a road consisting of a rail attached to a concrete stringer, which is borne directly on the rock of the foot-wall.

The stringer is about 13½ in. wide by 14 in. high. Beneath it and supporting it is a mass of concrete 16 to 18 in. wide extending to the rock. The depth of this supporting mass depends upon the irregularities of the rock-face to which it is attached. It ranges all the way from 4 in. to 2½ ft., and there is no reason why these limits might not occasionally be exceeded. The stringer and supporting mass are structurally one piece, being molded together. The stringer portion is reinforced by means of a 1¼-in. steel cable passing longitudinally through its interior. The rail is attached by bolts that are spaced three feet apart, and hold it by means of clips which grasp the rail-flange. The bolts pass through the stringer into a rectangular opening about three by four inches in section, which passes quite through the concrete, and affords access to the lower end of the bolt.

In building the road, a form of plank is constructed having the cross-section of the stringer, and a length of 15 ft. To its lower side are nailed the cores for the bolt-openings just mentioned. The top is left open. From one to three of these forms are supported in place underground by suitable means, and to the sides are nailed boards extending downward to the rock. These make the form for the supporting part underneath the stringer proper. When all is firmly secured the rock-face is thoroughly washed, and the concrete is filled in, beginning at the lower end.

[1] See *The Engineering & Mining Journal*, April 26, 1902, also *Electrical World*, April 26, 1902.

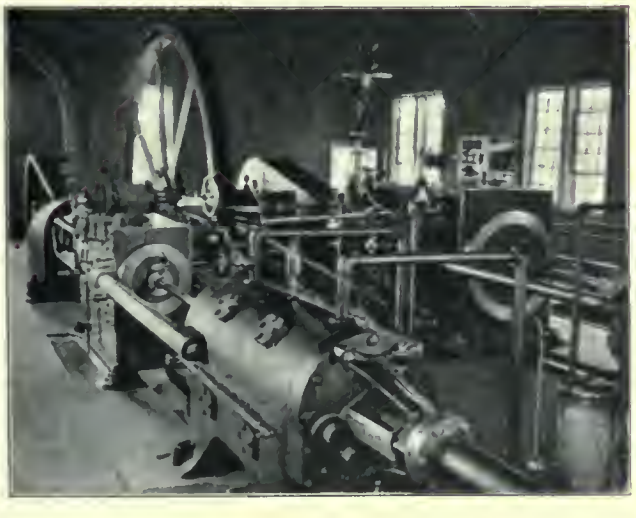
The mixture used is one part portland cement, three of sand, and five of crushed rock, and it is tightly rammed in place. As the filling proceeds the top of the form, or the cover, is completed by nailing on short pieces of plank. In the roads that have beeu built at a slope of 70° the structure is anchored to the foot-wall by heavy bolts spaced 8 ft. apart. When the concrete has hardened sufficiently, the form is removed and the rail is bolted in place. The road is then complete.

The first of these roads has been operating some three

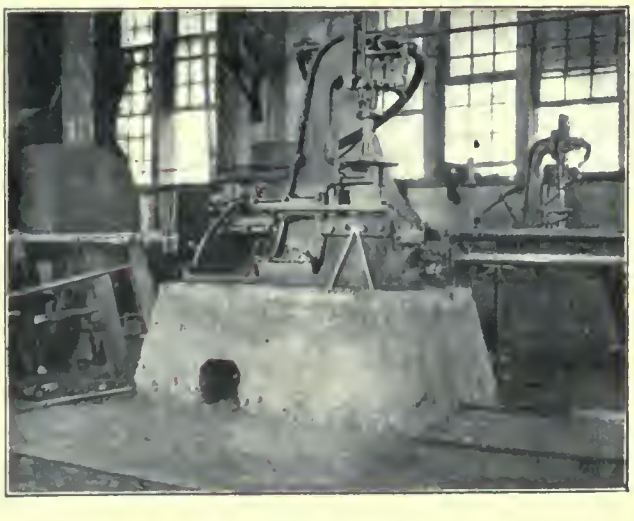
Mass Copper at the Trimountain Mine.

45-lb. Ingots of Copper.

years, and has proved so satisfactory that others have followed. Expectation regarding cost of maintenance has been fully realized, and, in addition, it has been found that the original cost of the road is less than that of wooden construction. Its disadvantages seem to be confined to the fact that, due to the unyielding nature of the



Ingersoll Compressor at Champion B. Shaft.



Word Drill-Sharpener at the Champion Mine.

support, the effect of a blow must be absorbed between wheels and rail, resulting in a perceptibly greater deterioration of both. However, this is far more than compensated by the decreased cost in other directions and the fireproof character of the road.

In the effort to counteract the increased costs due to great depth the economical generation, distribution, and use of power have naturally received large attention. The long period of operation necessary makes it worth while to expend large amounts of money in installing machinery of large capacity and high economy. The extreme in the direction of high-duty engines is represented at present in the Nordberg quadruple-expansion two-stage air compressor operating at the Champion mine. The engine is equipped with Nordberg's regenerative feed-water heating system. It holds the world's record for minimum consumption of heat per foot-pound of work delivered, having shown a duty of 195,000,000 foot-pounds, being about 9% in advance of its nearest competitor.

But one mine is so situated to be able to make use of water-power. The Victoria, situated near the Ontonagon river, has a water-power that has been utilized in a novel manner. Distance from source to points of application is not great and the power for both mine and mill is distributed by compressed air. Moreover, the falling water operates directly on the air without the intervention of water-wheel or other machine.

Roughly speaking, this hydraulic air-compressor consists of a large underground chamber cut from the solid rock and having a length of 281.5 ft., a width of 18 ft. and a depth of 26 ft. In normal operation the lower portion of the chamber is filled with water to a level of 14.5 ft. from its roof. The remainder, having a capacity of over 80,000 cu. ft. is filled with air at 114 lb. gauge. The water outlet is through a tunnel 18 ft. wide and 10 ft. high, the bottom of the tunnel being a continuation of the horizontal floor of the chamber. This tunnel opens into an inclined shaft about 18 by 20 ft. in cross-section, the discharge level of which is 271 ft. above the water-level in the chamber. The outlet for air is a 24-in. pipe leaving the chamber through the roof directly above the tunnel outlet.

The inlet for both water and air is through three verti-

cal shafts, each five feet in interior diameter, opening through the roof of the chamber at the end opposite to the outlets. Each shaft is tightly lined with concrete, and is continued down into the chamber by means of a somewhat flaring steel casing to a distance of about 15 in. below the water-level. Just beneath, and reaching somewhat into the opening of the casing, is a conical boss of concrete. From water-level in the chamber through the air and water-tight shaft to the water-level at the intake above is 343 ft. This is 72 ft. greater than the distance between the water-levels at the outlet end, and this difference expresses the available head of water.

At the intake, water is admitted through an annular funnel over a hollow ring from the flat inner periphery of which project 1,800 tubes of ⅜ in. diam. into the annular opening of the funnel. The water must flow over the mouths of these tubes, and in doing so it produces an aspirating effect, which entrains the air in small bubbles. The air comes mainly through the tubes from the hollow ring, which has suitable intake pipes extending above the water-level. The mixed water and air fall through the vertical shaft, and are discharged radially from the annular outlet formed by the concrete boss and steel casing below. The current through the chamber is slow, and the air disengages itself, collecting in the top of the chamber, and displacing the water. By its pressure on the water surface in the chamber it maintains the 271 ft. of difference in level between that surface and the one at the discharge of the outlet shaft.

While running at less than full capacity the water-level in the chamber is prevented from being depressed further than 14.5 ft. from the roof by means of a blow-off pipe, 12 in. diam., which opens somewhat below the normal water level. When the water has been pushed down sufficiently air enters this pipe, and its escape relieves the excess of pressure. When the blow-off is in operation the appearance at its mouth greatly resembles the eruption of a powerful geyser. The stream of spray, due to the entrance of water with the air from the chamber, is thrown sometimes to a height of 400 feet.

The capacity when all intake shafts are operating is about 5,000 h.p. So far but one intake is used. This under test at near its maximum capacity showed an efficiency of better than 82% while delivering 11,930 cu. ft. of air per min. at 128 lb. absolute pressure.

All machinery at the stamp-mill and at the mine, whether on the surface or underground, is operated by compressed air. Besides utilizing cheap power, the compressor has obvious advantages over the usual machine in the absence of parts to get out of order and in low cost of attendance.[2]

Cost of Dredging.

The following figures, giving the actual cost of dredging operations on two boats at Oroville, speak for themselves. They are worth more than many estimates:

COST OF DREDGING.

No. 1.

Year.	Cu. yd.	Total cost.	Per cu. yd
1903	485,016	$38,583.54	$0.07959
1904	466,262	43,430.32	0.09314
1905	352,826	35,699.32	0.10118
1906	465,207	35,401.30	0.07610
Four years	1,769,311	$153,114.48	0.08654

Using 3½-ft. buckets and in easy digging ground.

No. 2.

1905	589,082	59,115.10	0.10035
1906	557,084	55,454.00	0.09954
Two years	1,146,166	114,569.10	0.09996

Using 5-ft. buckets and in hard digging ground.

[2] See description by C. H. Taylor in MINING AND SCIENTIFIC PRESS, August 18, 1906.

Trading on the Curb.

Many persons are of the opinion that trading 'on the curb' is a new proceeding, but this is not so, as it is known that in 1720 a curb market existed in Paris and, as in New York, a part of the street was roped to mark the boundaries of the market. This French market finally became so large that it had to be moved to the garden of a prince, who rented out booths at an enormous figure. The Curb on Broad street was started in the early eighties, when less than a dozen men congregated in front of the Mills building and traded in a few hundred shares of stock daily. The issues bought and sold at that time were principally bank stocks. The Broad Street market pays no rent to the city for the use of the street, and enjoys most of the advantages and escapes some of the disadvantages that are compulsory in a regularly organized stock exchange. Commissions on the Curb are the same as on the big board, namely ⅛ of 1 per cent. The most conservative of the brokers use all possible means to prevent splitting of this regular rate.

The Curb is an open market. It has no admission fees, no restriction as to members, and no listing committees. This has often invited the question: Why is it that a man who wants to buy or sell a block of stock on the market does not do it himself? Can anyone trade in the market? How is the business transacted? These questions are but natural, but let an outsider attempt to save commission by transacting his own business and the question is answered. None but recognized brokers can do business in this market. Signatures of outsiders will not be accepted, and the traders usually put up a job on the newcomer if he attempts to introduce himself.

For many years the Curb has been recognized as a necessary adjunct to the Stock Exchange and its members are jealous of its good name. The Curb absolutely has no organization, by-laws, constitution, or rules for the transacting of business, but there are unwritten laws that are held sacred. The strict observance of these unwritten laws is remarkable when the status of the members is considered.

As in all lines of business, credit is absolutely necessary and credit is given freely without question to the members who prove themselves worthy of it. Very few cases of abuse have been reported. The Curb is a market of the moment where quick action is of prime importance and the short duration of time necessary to transact business is amazing.

When a new issue of stock has been announced in the newspapers or on the ticker, rights to subscribe to the new issues are being traded in on the Curb sometimes within 20 minutes after the announcement. When new companies, formed to absorb two or more old concerns, file papers of incorporation and the news reaches the Curb, the stock of such companies is at once traded in for 'when issued.' This necessitates instant reckoning as to the actual worth of the securities. The brokers seem to solve the problem, figure it out, and start trading in a remarkably short time.

THE 'shell,' or jacket guides, of a rock-drill, when worn, allow the machine too much play, which is likely to break the feed screw and considerably affects the efficiency of the machine, inasmuch as it will waver slightly, each blow of the drill increasing the friction and thus reducing the efficiency.

ASHED DIABASE is a local name used on Keweenaw Point, Lake Superior, for a rock resembling a conglomerate, but which has been interpreted as a very scoriaceous amygdaloidal sheet into which much sand was washed in its early history.

The East Country of the Mother Lode.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN A. REID.

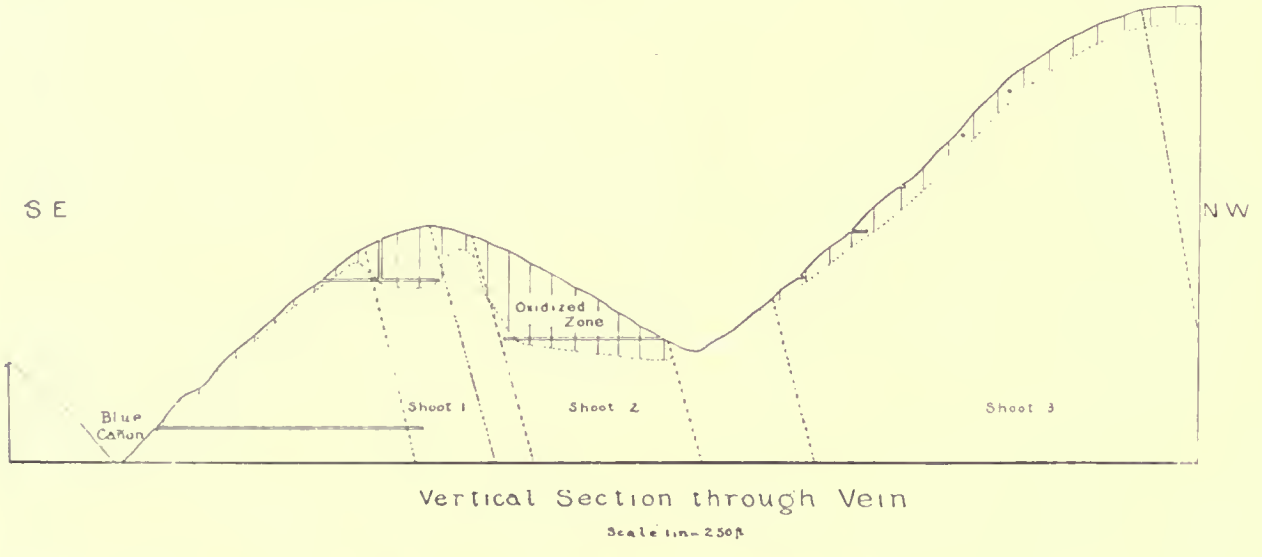
Although gold mining in California has flourished for over half a century, our knowledge of all the mineral resources of the State is still fragmentary. Particularly is this so in regard to that region lying betweeu the middle belt of the Mother Lode and the crest of the Sierra Nevada. Many promising mineral deposits are known to exist in this tract. In this connection the Shady Run miue presents some interesting features.

The Shady Run mine is situated in Placer county, near the railroad, at Midas. This station is four miles west of the village of Blue Cañon, and eight miles east of the mining town of Dutch Flat. The surrounding country marks the upper limit of placer mining, and the old river channel which is cut by the railroad at several polnts near Shady Run, was mined extensively before the anti-debris litigation.

Topographically, the region is a flat-topped divide separating deep cañons. The relief is great and the cañons are so rugged as to be almost impassable. The mining claims reach from Blue Cañon creek, at an elevation of 2,600 ft., to a line near the railroad, at an elevation of 4,000 ft. A difference in elevation of 1,400 ft. is gained in less than three claim-lengths. Timber is plentiful in the cañons and other spots not easily reached, though largely culled on the ridges. Water is also plentiful. The oldest rocks of the immediate locality are all part of the auriferous slate series, of Carboniferous age. At the mine these are fissile dark clay-slates, with a few quartzose beds, striking N. 41° W., and dipping from 80 to 85° NE. A 16-in. lens of limestone, showing traces of crinoid stems, also appears at one spot 100 yards east of the vein. The later rocks comprise volcanic tuffs and flows, and the auriferous gravels.

The great rarity of igneous rocks in the Blue Cañon formation has been noted by Lindgren[1], yet a surprisingly large number of feldspathic dikes occur in the locallty and follow the slates in strike and dip. The dikes are all similar, and chemically almost identical. On physical grounds they may be divided broadly into two types. One of these constitutes a series of about ten thin intrusions from three to twenty inches wide, constituting one large multiple dike. When fresh the color is a light pearl-gray, and the grain exceedingly fine. The color on weathering is first white; on further exposure dark reddish zones of complete oxidation appear, gradually extending inward until the whole becomes a red pulverulent mass. Outcrops are never visible. The second type occurs in one or two larger dikes, from four to twelve feet wide, in part not showing on the surface, and in part outcropping strongly. The fresh rock is of a rather dark-gray color, suggesting a diabase, and the grain medium, with feldspar crystals averaging one-eighth of an inch long. Pyrite is visible in small grains. Toward the periphery of the dikes there is an evident effect on the slates, and the intrusive rock has assumed a schistose appearance — but it is only an appearance.

Under the microscope both types are seen to consist of albite feldspar (ankerite), and a small amount of original pyrite. The albite is in tabular crystals, with frequent Carlsbad twins, as well as the usual albite lamellæ. In the finer grained rock the pyrite is evenly distributed throughout in small grains; in the other rock the pyrite is in larger grains, many of which are secondary. Also, in the partly oxidized coarser rock the tabular feldspars show much black opaque substance between them. This is probably secondary manganese dioxide, from the decomposition of the ankerite, which reacts for manganese.



Vertical Section through Vein

Scale 1in.=250ft

Dikes of this nature have been noted by Turner and others[2], and still present a field for research, bearing both upon the mining geology and the general geology of the Sierra Nevada.

The ore deposits at Shady Run, like the dikes, are divisible into two parts: (1) A quartzose pyritic gold ore; (2) an ore rather low in silica, heavy with arsenopyrite, and containing free gold. These two are distinct, yet grade from one to the other. The first kind is associated with the thin dikes, in seams either parallel to the dikes or cutting in all directions across them. The gold contents are low, but pockets containing coarse free gold occur. A large 'stringer lead' of this character exists about 600 ft. east of the main vein. The second type of deposit is connected genetically with the coarser grained dikes, and consists of a well-defined vein in, or adjoining, the dikes. Small seams of ore and gangue run from the vein into the dike and slates more or less horizontally, the whole carrying, in the ore-shoots, considerable value in gold. The ore-shoots are three in number, as shown in the accompanying sketch. In the largest, the northern, the gold is evenly distributed; in the other two, it occurs irregularly distributed; the more so in the south shoot. This condition is rather common in deposits of arsenopyrite.

There is a distinct zone of oxidation, but no secondary

[1] W. Lindgren, Colfax Folio, U. S. G. S., text.
[2] H. W. Turner. 'Further Contributions to the Geology of the Sierra Nevada.' 17 *An. Rept.* U. S. G. S. Pt. 1, p. 663. C. A. Aaron. 'The Shaw Mine Lode in Eldorado County.' *Eng. & Min. Jour.*, Nov. 19, 1892.

enrichment[3]. The arsenopyrite is readily converted into a soft earthy red limonite, which stains everything a yellowish red. In the more open portions of the shoots the alteration has proceeded downward for nearly 200 feet.

The ore minerals, with the gangue, are interesting and peculiar. The value is in free gold, with some gold held in the pyrite and arsenopyrite. The gangue consists of quartz and albite in about equal amounts, or with a preponderance of the feldspar, and ankerite containing manganese. All these minerals are of the same age, being crystallized one on the other. The gold is coarse, at times as large as grains of rice, and in the oxidized zone it is frequently (and actually) 'rusty.' It is of good grade, worth over $18 per ounce. The arsenopyrite, albite, gold, and pyrite were in part earlier than the others, but the latter stage of their deposition coincided with the earlier stage of the deposition of the main masses of quartz and ankerite. A marked peculiarity of the ore is a deposit of glistening small cubes of pyrite clustered over the surface and sharp edges of the flat rhombohedrons of ankerite. In the numerous vugs in the veinlets through the dike and slates some fine crystals of all the minerals are developed. The clear glassy tabular feldspars are especially fine. The later pyrite occurs, with few exceptions, on the carbonate, showing that the latter mineral possessed some power of precipitating the sulphide from the containing solution. The ankerite is peculiar in its content of manganese, the reaction for which was obtained with the blowpipe. The zone of oxidation is marked by a large amount of secondary wad, the earthy oxide of manganese, which gives a hint concerning the nature of the black opaque substance shown by the microscope in the dike rock. The source of the ore is connected with the dike itself, as the gangue minerals are the same. The solutions were evidently rich in alkaline carbonates, and probably represented the last stages of consolidation of the acid magma below. Further, the rather large amount of hydrothermal action between the intrusive rock and the slates indicates a pneumatolytic character, in part at least, of the dike.

There are a number of other mining properties near Shady Run. The only one now producing is the Rawhide, situated about two miles south on the north fork of the American river. Ten stamps are dropping. The ore is a gold-bearing quartz, said to be rich. A large quartz vein outcrops to the east of Shady Run, from Blue Cañon to the railroad. It strikes north and south, and the greatest width exposed is over 50 ft. Nothing is yet known of its value. This whole belt of country is well mineralized, and needs much more intelligent examination. And this is true of all the larger area of the so-called 'east country.'

DURING the past seven years, from 1900 to 1906 inclusive—the fiscal year ending June 30—the Homestake has disbursed for mine labor $10,253,532.78, and for dividends, $7,648,600. During the fiscal year of 1906, it paid in dividends $1,310,400 and for labor $1,665,798.22—about 32% of the gross yield of the mine for the year.

IN the degree that 'organized common sense' or science has been a factor in the lives of men and nations, men and nations have been happy and effective. The ultimate function of science is the regulation of human conduct.

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[3]This fact supports strongly the recent experiments of Stokes upon the solubility of gold in ferric sulphate. In spite of the large amount of this reagent that has been formed by the oxidation of the ore, no perceptible transposition of the gold has occurred. See *Economic Geology*, Vol. I, No. 7, p. 650.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

While in some instances courts have questioned the necessity of an actual discovery of mineral upon gold placer ground, it is now the established rule that appropriate discovery is as necessary to the location of a placer claim as to the location of a lode claim.

Steele *v* Tanana Mines R. Co., 148 Fed. 678.

A showing of colors of gold in each instance of panning, and the fact that many of the pans gave what miners call "good prospects" of gold, was held insufficient to justify a person of ordinary prudence in further expending labor and means with a reasonable prospect of success. Such prospects were insufficient to show that the land was so valuable for mineral as to take it out of the category of agricultural lands, and to establish its character as mineral land, in a contest between a mineral claimant and another claiming the lands under other laws of the United States.

Steele *v.* Tanana Mines R. Co., 148 Fed. 678.

When the controversy is between two mineral claimants, the rule respecting the sufficiency of a discovery of mineral is more liberal than when it is between a mineral claimant and one seeking to make an agricultural or other entry under the land laws. The reason for this distinction is said to be that, when land is sought to be taken out of the category of agricultural lands, the evidence of its mineral character should be reasonably clear, while in respect to a controversy between rival claimants to mineral land, the question is simply which is entitled to priority.

Steele *v.* Tanana Mines R. Co., 148 Fed. 678.

The owners of three-fourths of a certain mining claim gave another person permission to enter into possession of the claim and make the location of another claim; thereafter the owner of the remaining one-fourth executed a ratification of the abandonment of the first named claim; under such facts, it was held that subsequent locators could not complain that the initiation of the second claim was by trespass, and that the ratification did not validate it.

Oberto *v.* Smith, (Colo.) 86 Pac. 86.

In an action to recover possession of unsurveyed Government mineral lands, where prior possession was the sole question involved, the court ruled that it was not necessary for the plaintiffs to allege that they had the necessary qualifications, such as being of lawful age, etc., to enter Government lands nor to state a good cause of action and entitle them to recover.

Davis *v.* Dennis, (Wash.) 85 Pac. 1079.

Where a person was induced to purchase mining stock by fraudulent representations, it was decided that he was not prevented from rescinding the sale on account of such fraud, because the stock had decreased in value.

Barron *v.* Myers, (Mich.), 109 N. W. 862.

A mining claim may be said to be abandoned when the locator leaves it without any intention of returning, and without regard as to what becomes of the claim or who may appropriate it. But the mere leaving of a claim with intent to return later is an abandonment.

Davis *v.* Dennis, (Wash.) 85 Pac, 1,079.

A lease giving the lessee for a term of years the right to mine and operate for oil and gas, does not constitute a sale of the oil and gas in place, and the lessee has no vested estate therein until gas or oil is discovered; but under such a lease it was held that when such oil or gas was found, the right to produce became a vested right, and when gas or oil was extracted, the title vested in the lessee, and the consideration or royalty paid for the privilege of search and production was rent for the leased premises.

Headley *v.* Hoppengarner (W. Va.) 55 S. E. 744.

The Old Camp of Ward, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By H. R. PLATE.

Ward, in White Pine county, Nevada, has been deserted for the past 25 years, but owing to the development of the great copper deposits of Ely, it now exhibits signs of life.

The Martin White mine, which supported the town of Ward, was one of the large producers of Nevada during the '70s and early '80s, and is credited with a production of several millions of dollars in silver and lead. A brief description of its situation and a little of its history will be interesting and give one a better idea of the adverse conditions under which the mine flourished in those days.

The mine lies on the west slope of the Steptoe valley, in the Egan range, about 16 miles south of Ely. In the early days the nearest railroad point was Palisades, on the Southern Pacific, a distance of about 200 miles; machinery and supplies were hauled by teams from this point and the ore and bullion were hauled out in the same manner to be shipped to San Francisco. Under this handicap and a still greater one, of poor milling and treatment methods, which I will describe later, the mine prospered and declared dividends until it finally shut down when silver depreciated. From company letters and books found in the mine-office and bearing the dates of the '70s, the cost of mining and milling was approximately $50 per ton, consequently ore running below that figure was left in the mine. The tailing from the mill ran about $16 to $20 per ton. The mine was not intelligently developed or prospected; a system of 'gouging' the richer ore, with no thought of tomorrow, was carried on. I am told that many thousands of dollars of rich ore and even bullion was stolen from the company.

With the above as a brief introduction to the conditions that existed in those early days, one can better understand the simpler problem that the operators of today have to contend with.

The geological formation of the district is limestone, stratified and slightly tilted from the horizontal; through the lime are numerous intrusions of porphyry. These dikes vary slightly in direction and thickness, but generally have a northwest and southeast strike and a dip to the southwest. The orebodies occur in a filling between the lime and the porphyry, and the mineralized solutions have penetrated the softer rock (porphyry) and deposited the sulphides for some distance from the contact. The ore varies in width from a few feet to nearly a hundred feet. The deposit, as a whole, resembles those of Red Mountain, near Ouray, in Colorado.

At, and near, the surface the ore was rich in silver, containing also lead and small amounts of gold and copper; as depth was gained the copper increased and the silver decreased; I am told that, in places, rich gold ore was found associated with wire silver and silver nuggets, some of the ore being almost solid metal. The length and depth of the orebodies were never actually established, I believe, for, as I have said before, the system of 'gouging' near the surface (150 to 200 ft.) predominated and systematic development was neglected.

The character of the ore, as shown at different points on the surface, varies greatly; at one point it will be entirely copper carbonate, and a few hundred feet away galena and lead carbonate; none of the rich silver or gold ore remains on the surface or dumps; lessees have removed it.

During the life of the mine, a lead smelter, of possibly 100 tons capacity, was built and operated for a short period; this was an unsatisfactory treatment, owing to the increasing percentage of copper. Next a lixiviation plant was erected, tried, and abandoned; finally a 20-stamp mill was built and run irregularly until the mine was shut down (about 1883). The method of treatment, in this mill, was as follows: The ore was crushed and dried upon an open iron floor, then roasted in a revolving tubular furnace; from the roasters the ore was elevated to the stamps and crushed to 40 mesh and run to the pans to be amalgamated; the product from the pans went to the creek. From a study of the ore, which contained galena, copper sulphides, and carbonates, one can readily see why the tailing assayed so high. To do justice to the operators of those days, however, such a mill was practically the only type on the market and it was a question of making the ore suit the mill, if possible; today we have a wide choice and can design a mill or smelter to suit the ore.

As development progresses and the orebodies are opened to a greater depth, the ore is likely to become a copper sulphide with some gold and silver; in that case it will be a typical concentrating proposition and little trouble will be experienced in making a good saving.

The old workings consist of several adit levels, numerous shafts and open-cuts. All the adits and shafts are badly caved and little can be seen of the underground workings, but the dumps give mute evidence of what was encountered during the old days. Most of these dumps are covered with copper ore that had been sorted and thrown out to assist the treatment in the smelter and mill; the copper seemed to be the sole source of the trouble, and it was kept out of the ore in every possible way. The dumps from the mine, smelter, and mill have been sorted over and worked by lessees, who have made money from them, but there still remains a good profit for the company when it is ready to treat them with the proper methods of mechanical concentration. The product can, today, be shipped by rail to the custom smelters at Salt Lake, and be treated for a nominal figure, or later it can be treated at Ely, when the Nevada Consolidated Copper Co.'s smelter is completed.

The greatly improved methods of ore reduction, together with cheaper transportation, and the high price of lead and copper, will make it possible for companies to open and successfully operate properties of this type, which have lain idle for many years. Nevada has many such idle mines as the Martin White, and I shall not be surprised to hear that many of them will be re-opened and prove themselves far from worked out.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Specimen from Cedarville, Cal., marked F. A. E., is Quartz with galena.

Those from Orleans, Cal., marked C. S. L., are: No. 1, chloritic schist, with crystals of Pyrite; No. 2, altered Diabase; No. 3, brown Jasper.

The specimens from H. M. R. of Tonopah, Nev., are: No. 1, scaly talcose rock; No. 2, Mica-schist with pyrite; No. 3, Quartzite with Pyrite and stained with iron and manganese oxides; No. 4, Volcanic Breccia; No. 5, tufaceous Sandstone; No. 6, Chert; No. 7, vesicular Lava; No. 8, highly altered rock containing manganese oxide and limonite; No. 9, Basalt; No. 10, Pegmatite; No. 11, green Jasper; No. 12, Quartz containing Rhodonite; No. 13, missing; No. 14, Rhyolite; No. 15, serpentinized rock with dendritic manganese oxide; No. 16, Clay, stained by manganese; No. 17, altered Pegmatite; xy, altered Mica-schist.

A Slag-Casting Machine.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

Mr. B. N. Bennetts, superintendent of the Garfield smelting plant of the American Securities Co., while in charge of the blast-furnaces of the Tacoma Smelting Co., at Tacoma, Wash., installed and put into successful operation the slag-casting machine shown in the accompanying illustrations. Fig. 1 gives, in plan and section, the general arrangement of the machine, the hoist, and the position of the furnace and fore-hearth supplying it. Fig. 2, 3, and 4 give the details of the automatic dumping device for the discharge of the matte or slag from the molds.

The machine consists of a continuous bed of molds resting on two 3 by 5 in. angle-iron rings, as shown in cross-section in Fig. 4, these rings being supported at every four feet by a pair of wheels and axle rolling on a circular track of 3.6 ft. gauge and 62.5 ft. diam., centre to centre of the tracks, the molds moving in the direction shown by the arrows in Fig. 1. The molds are furnished with trunnions revolving in bearings attached to the angle-iron rings, so that they can be reversed in order to discharge their contents into hoppers set below them as shown in section. As the plan in Fig. 3 indicates, the inner trunnion

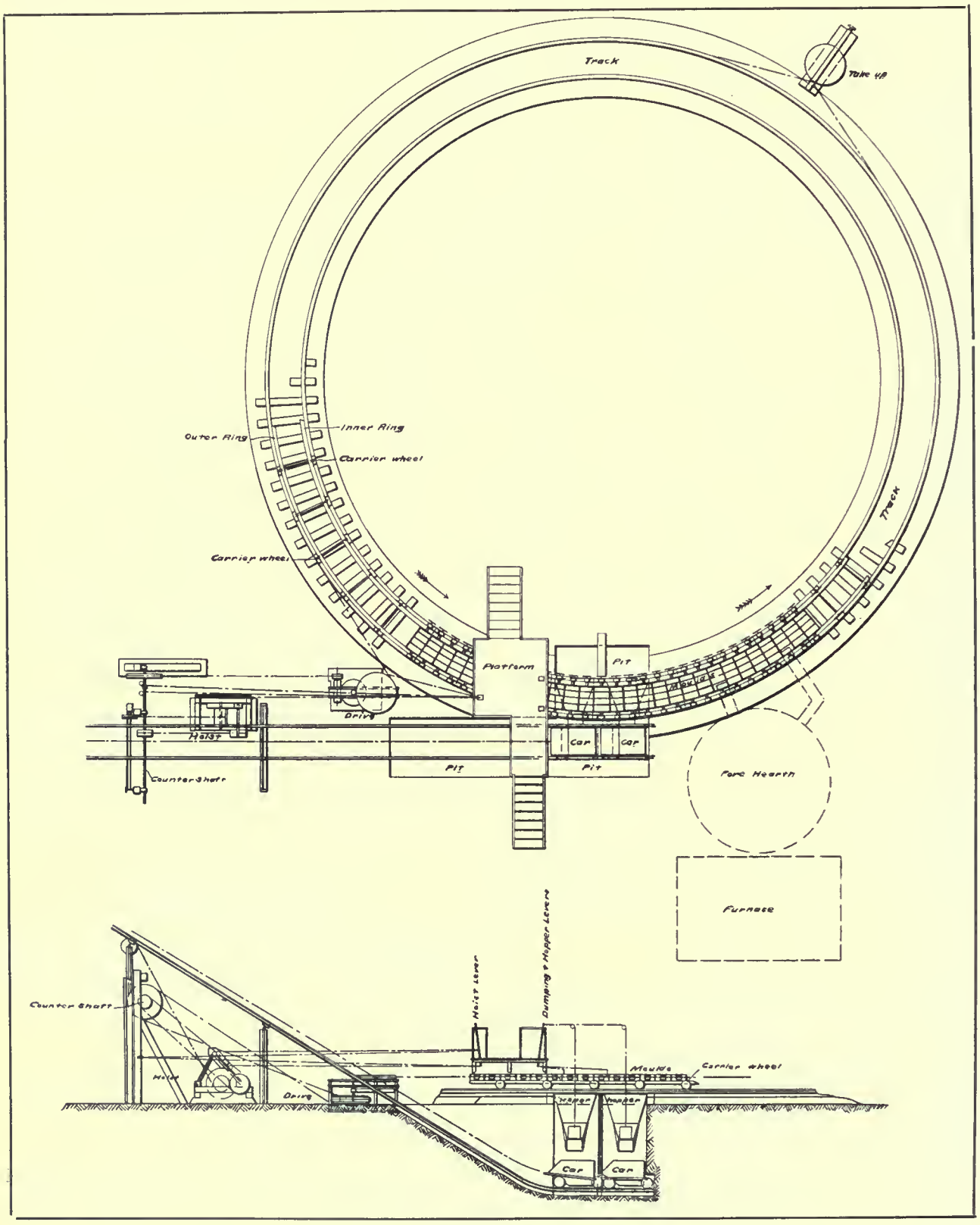


Fig. 1. Plan and Section of Slag-Casting Machine.

carries a cross-arm having two pins, one (*m*) larger than the other, the other view of the cross-arm being as shown in *g* in Fig. 2. Above the hoppers on the inner side of the track is the tripping device by which the molds can be tipped over and emptied at the will of the operator, who stands on a platform at this point. The device consists of a frame carrying guides into which the larger pin of the cross-arm engages. The molds overlap so that the

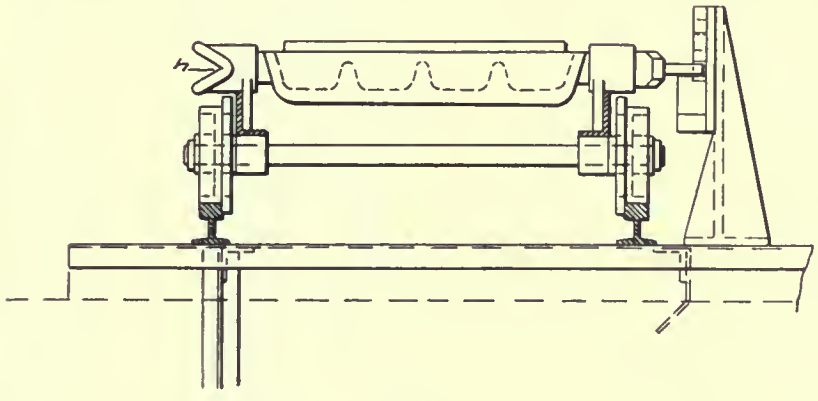


Fig. 4.

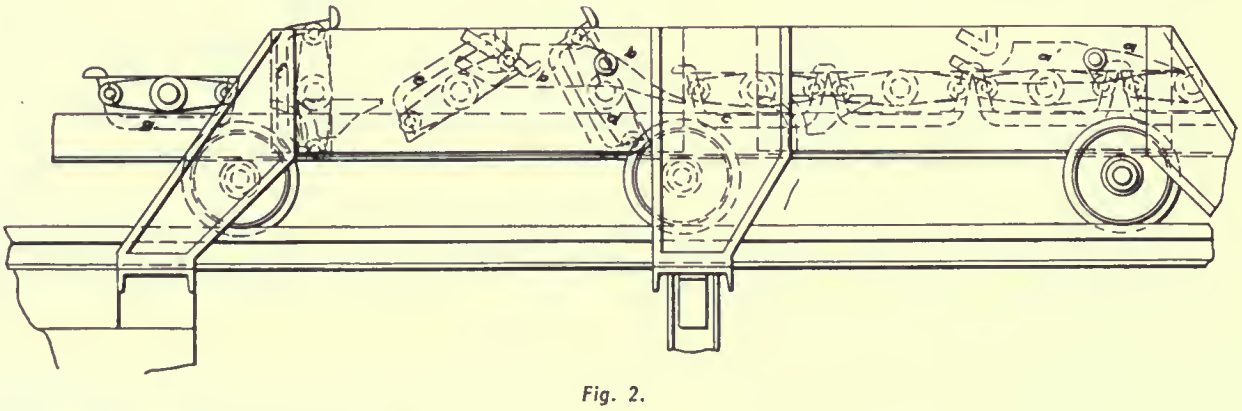


Fig. 2.

joint between them is covered and the machine being put in motion, the molds are filled as they continue to revolve. When the filled molds come around to the hoppers, the operator raises the latch *b* in Fig. 2, for example, and the pin *m* guides through the grooves of the frame inverting the mold when it assumes the position *e*. Moving on the other pin *k*, the mold encounters a guide-block which restores it to its original position ready for again filling. For the other hopper there is a latch *a*, so that either hopper can be filled at will. The operator can, by operating a lever, also open the hopper-slide when he wishes to load a car. The molds are filled from the fore-hearth set high enough to discharge both slag and matte to the molds. When matte is cast, a hopper is reserved for it. The mold ring is revolved by means of an endless-rope drive, and the rope is kept tight by means of a take-up on the side opposite to the drive.

Both matte and slag are hoisted by the cars shown in Fig. 1 to receiving or storage bins (not shown) whence the material may be drawn off, the slag being sent to the dump while the matte is re-crushed for roasting. There are 144 molds, each capable of holding 144 lb. of slag, and the mold-ring makes one revolution in 40 seconds, or 10 tons in that time. The operation of the machine is intermittent, the operator stopping when molding is not needed. Each of the blocks of one mold weighs 36 lb., when the mold is completely filled, but evidently when thinner blocks—as of matte—are needed, they can be just as readily cast. There is no need of cooling by water under ordinary circumstances of furnace running, and the inconveniences of water cooling are thus avoided, but for large capacity it is obvious that this, as well as a mold wash, could be added. The molds are given the clay wash by hand. Five or six horsepower is enough to operate both machine and hoist, and one man can operater it. It is intended to put in a similar machine at Garfield.

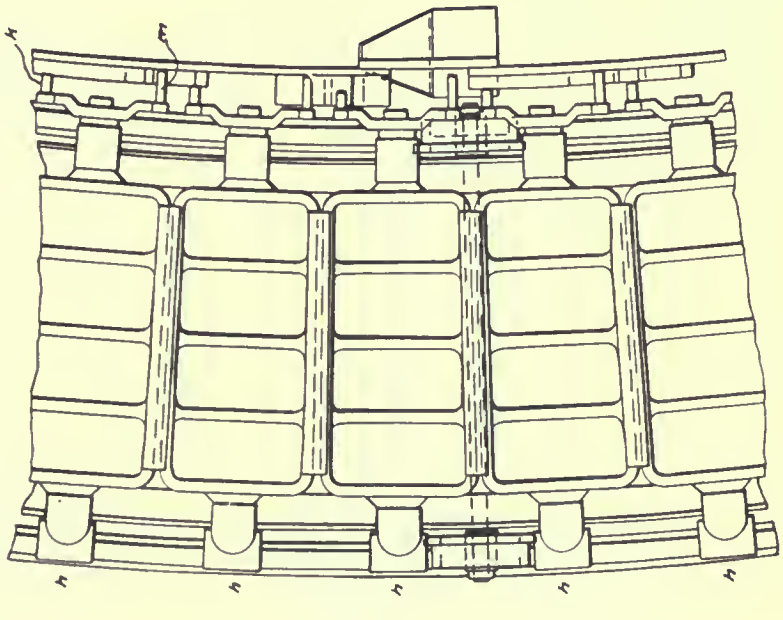


Fig. 3.

In the operation of air-compressors the best results are obtained when the areas of the suction and discharge valves are equal and of such proportions that the velocity of the air does not exceed 5,500 ft. per minute. On a compressor run with a piston speed of 550 ft. per min., this requires a valve area equal to 10 per cent of the piston area. The practice of making suction-valve areas larger than those of the discharge valves is not advised as, while the incoming air is of greater volume, the discharge valves remain open for a very small proportion of the stroke.

For transmission of power in mines where compressed air is used, it has been found that, for general purposes, a moderate pressure of 6½ to 7 atmospheres is the best practice.

A Miner's Drills and His Work With Them.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

I was somewhat surprised, not long ago, to read in a prominent mining journal that a set of miner's drills ranged in length from 8 to 24 inches. I was taking my regular physical culture exercises at the time and I said to myself: "That cross-cut you are driving wouldn't go in very fast if you had no steel longer than 24 in. and the contractors working for you at the tunnel would throw up their job if they were limited to such lengths."

Out of curiosity I kept a record of the holes I drilled the next day. One was 13, one 25, and one 31 inches. The first was a relief hole, the others were down holes in the face of a cross-cut. The next morning I put in a breast hole as high up as I could without spoiling it as a water hole, and it went in 36 inches. With a set of drills, the longest of which was 24 in., one can put in a hole as deep as 20 in., but the average hole made with drills of such a length will be about 18 in. I know I could not have done the work accomplished by the 36-in. hole above mentioned with less than three 18-in. holes and the chances are it would have taken four. I often feel when I get a hole in as far as a 24-in. drill will make it: "That's a good collar; now make a place for the powder."

The most expensive part of mine work is drilling and a good workman learns to put in deep holes. He may put in a number of short holes to get a chance for a good long one, and if at all skilled, he shapes his ground to that end. Occasionally this is done by carrying in the bottom, then reaching out with long down holes and long breast holes. Sometimes one will carry in the centre and then by well placed down holes and an upper, each of which would be over two feet in length, make things count for good. Sometimes in driving along a seam, there is a gouge or soft place on one wall; and a man will put in a day or even longer clearing this out so that he may put in long holes and break to this crack.

If I had a workman satisfied with a set of drills, the longest of which was but 24 in., I would feel that it was not possible for him to do as good work as he could with longer steel, and I would encourage him to reach out after more ground. I have had men work for me who always placed their holes so that they broke perfectly. I would rather have one who occasionally failed to get all he expected. He will accomplish far more in the long run. Objection to long holes is made by some because they cannot always be made to break to the bottom. In loading holes I never load a long hole with dynamite for half its length. Suppose that in drilling I have crossed a slip; the hole may break to this slip only, and leave the bottom part unbroken. It is easy to load it again, with three half-sticks of dynamite, and, all told, I have not used more explosives than some persous would use at the first charge, and I get results—something one seldom gets by loading a hole nearly a full length. Suppose a man has been driving in ground which has broken well and he has reason to think from the way the hole has drilled that the ground may not break as perfectly as he first thought. Ground changes in character sometimes in a very short distance. The wise workman does not run the risk of spoiling the hole that it has cost so much to make. He loads light, to chamber the bottom of the hole. He then re-loads with such powder as can be placed in the bottom of the hole, where it will do good execution, and makes things come as he wishes. Any fool workman can blow the collar off a hole and spoil the rest of it. All he has to do is to use powder for tamping, as too many do, and then curse his luck. It is the bottom of a hole where the explosive is needed. I never knew a man whose hole broke at the bottom who had to re-load the collar.

I have written thus far concerning development work. There are veins, of course, where it is advisable to drill short holes only. One must use intelligence and adapt the work to conditions. Eight to ten years ago, at a mine three miles from where I am working, sets of drills were used, the longest of which was seven feet in length. This was in breaking orebodies 6 to 14 ft. wide. It was a usual thing to put in holes by hand six feet in depth, charge with three or four sticks of powder, fire, load again with 5 to 10 lb. of explosive (half a box, the men would say) and fire again. It stood one in hand to be out from under when one of these charges went off. The ground was broken on such a scale that it was often necessary to put in numbers of pop shots to break up masses that were blasted down. Work with drills 24 in. long would be child's play in comparison to this.

If I were making a set of drills from new steel, for the ordinary work in a mine, I would make the shortest cut 12 inches. It will wear down and make a shorter starter in time, short enough so that eventually it will be made into a gad or a moil. I would make each additional drill four inches longer until I had a set with the longest drill 44 in. There should be twice as many drills up to 30 in. as beyond, because most holes will be under two feet, but I would outfit a man for deep holes and encourage him to get them in wherever possible.

A word as to the shape of the bit. Bits are made either crowning or chisel-pointed. The crowning bit is crescent shaped on a profile view, the chisel-pointed straight across. For years I believed that the crowning bit was the only bit for hard ground, but experience has taught me the contrary. The chisel-pointed bit can be made to stand as well as the other and as a cutting bit it is far superior.

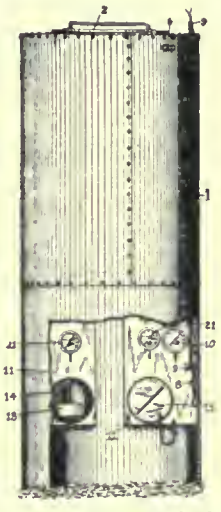
ALUMINUM.—It is of interest to remember that, nearly a hundred years ago, Davey dissolved alumina, but failed to isolate the metal, although he named it. It was not until the year 1855 that the French chemist, Deville, showed that aluminum could be prepared on a large scale and in a compact form without very much difficulty. Although the mineral cryolite, which is found in Greenland and is a double fluoride of aluminum and sodium, was the one first used for the manufacture of aluminum, nowadays bauxite is used for the purpose. Bauxite is a clay consisting chiefly of alumina or oxide of aluminum, and oxide of iron. Electrolytic methods are employed in the preparation of the metal, and full advantage is taken of the hydraulic power at Neuhausen, and, on a larger scale, at Niagara, to obtain the current necessary. Aluminum is very malleable and ductile, and in tenacity it approaches iron. It fuses at about 700° C., and does not oxidize. It has been known for some time that aluminum forms suitable alloys with copper, although the above-mentioned reports place the properties of all these alloys on record for the first time. Aluminum appears to alloy with tin, and has been used for optical instruments, and it is therefore possible that further research will be done on aluminum and copper alloyed with tin.

ASBESTOS.—Recent prospecting in the northwest part of India has disclosed a number of veins of asbestos, samples of which have been sent to the consulate-general with inquiries as to the demand for asbestos in the United States. The veins are reported to be four feet broad and just how deep has not yet been ascertained, but it is believed by experts that the deposits are extensive. The quality seems to be good, and those directly interested are quite sanguine of being able to make shipments in considerable quantities within a short time.

MINING AND METALLURGICAL PATENTS.

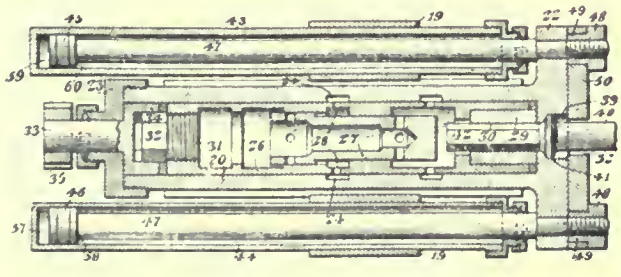
Specially reported for the MINING AND SCIENTIFIC PRESS.

DEVICE FOR PROSPECTING AND MINING FOR GOLD.—No. 843,606; Robert Hornbeck, George B. Campbell, and Basil F. Hite, Sacramento, Cal.; said Campbell assignor to said Hornbeck.



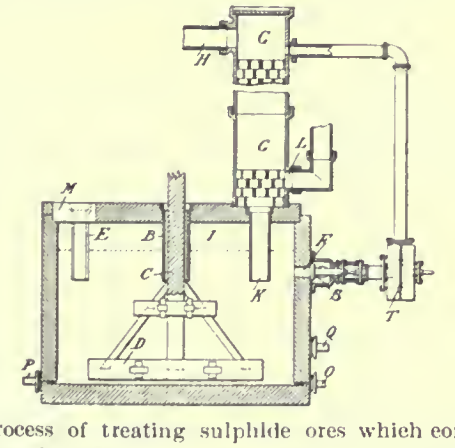
In a device of the character described, a main bottomless tube, an air-tight cap on the upper end of said tube, a plurality of smaller tubes arranged within said main tube and suspended from the top thereof, said smaller tubes being closed at both ends and having openings near their lower ends, air-tight covers for said openings, said main tube and smaller tube adapted to be filled with compressed air, and hoisting means arranged within the smaller tubes, substantially as described.

ROCK-DRILL FEEDING MECHANISM.—No. 843,718; Thomas Turner, Ottumwa, Iowa.



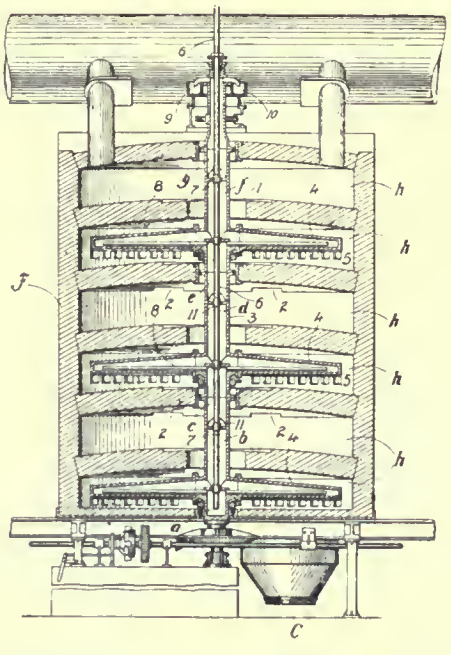
In mechanism of the class described, the combination with a motor, of a plurality of fluid-actuated feeding devices for moving the motor, and means for admitting motive fluid to one or more of the feeding devices to vary the pressure thereof upon the motor.

PROCESS FOR THE TREATMENT OF SULPHIDE ORES.—No. 843,986; Harry Baker, and Andrew T. Smith, Weston Point, England.



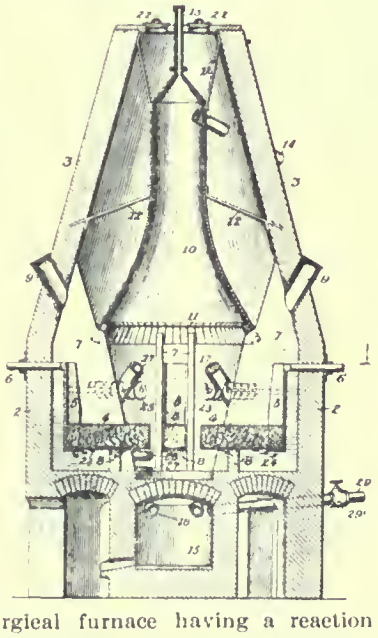
The process of treating sulphide ores which consists in submitting the ores to the action of chlorine, in the presence of water and a metal capable of forming both higher and lower chlorides, in such a manner as to form the higher chloride, which immediately reacts on the ore to form chlorides of the metals contained therein, and is itself reduced to the lower chloride, treating the solution in such a manner as to reconvert the lower chloride into the higher chloride without permitting free chlorine to come into contact with any sulphur which may have separated, again submitting the ore to the action of the regenerated solution, and so on continuously until the desired metals are fully extracted from the ore.

ROASTING-FURNACE.—No. 843,825; Frank Klepetko, New York, New York.



In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, a feed-pipe communicating with one of the terminal chambers of the series for conveying a cooling medium thereinto, and a water-feed pipe extending through the several chambers and discharging its water into the same.

ELECTRIC FURNACE.—No. 843,776; Edward R. Taylor, Penn Yan, New York.

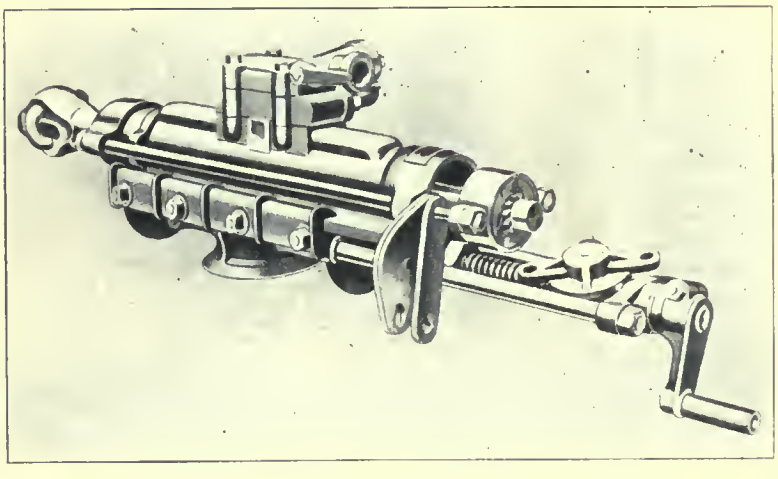


A metallurgical furnace having a reaction zone, and means for feeding portions of the charge through a surrounding body of the charge to said chamber, and means for feeding a suitable charge downwardly in proximity to the periphery of the furnace, and then feeding portions of said charge inwardly through a surrounding body of the charge to said chamber, and a collecting-chamber below said reaction-chamber, and intermediate conduits, said conduits arranged to traverse the incoming charge.

The Chicago Giant Rock-Drill.

The designing of a successful machine-drill calls for an intimate knowledge of the conditions and ruggedness of service in which it has to operate and perform successful work. As it stands today the machine-drill represents an evolution of improvement, made necessary by a long line of demonstrations and failures in actual service. In the design and development of the machine shown in the accompanying illustration (the Chicago Giant Rock Drill), full advantage has been taken of the opportunities presented by embodying such features as have proved their fitness in successful service, combining them with improving features.

Every detail has been given careful consideration as to its desirability; suitability of material and weight. One of the improved features is the shell, which is of the adjustable type, constructed so as to provide for double side bearing for the cylinder; and the shell caps are so made that they will 'take up' wear in two directions (horizontal and vertical) with one adjustment. A removal cylinder stop is also



The Chicago Giant Rock-Drill.

provided in the lower end of the shell. Its function is to prevent the cylinder from slipping out of the shell in case the feed-screw should be run out of the feed-nut. On the other hand, should it be desired to remove the cylinder from the shell, all that is necessary is to first remove the stop, then by turning the feed-screw run the cylinder down in the shell until the feed-screw is out of the feed-nut; this will allow the cylinder to be slipped out of the shell without any dismantling of the machine.

The cylinder is cast from a special mixture, having a tensile strength of 35,000 to 38,000 lb., and presenting a fine polished surface when finished. The upper end of the cylinder is extended to form a chamber for the rotating mechanism, which is of the releasing type. Three parts are used, thus equally distributing the rotating effort, and the pawls are constructed so that they are reversible; that is, should one of the engaging edges wear out, the pawl can be reversed so as to present the other and unworn edge to engage with the ratchet. This is an important point, as it makes provision for doubling the life of each pawl. The ratchet is of one piece, with the rotating or rifle-bar, which is extended on its upper end to fit into a chamber or recess into the upper head, this provides for the holding of the rotating bar in a central position, and relieves the rotating mechanism of all side strains. The valve motion is positive and is of the tappet or rocker type, modified to give a short stroke feature, the length of the stroke being at all times completely under the control of the operator. The supporting pin of the rocker works in removable steel bushings, and is completely enclosed, it being kept in place by caps easily removable, but which are securely locked in place by the valve-seat when machine is assembled.

One of the most valuable features of this drill lies in the provision for automatic lubrication. An oil reservoir chamber is provided in the valve-seat, and communication is made between the oil-reservoir and the interior of the valve-chest. The oil is led through this channel into the chest, where it mixes with the operating fluid and is carried by it into the interior of the machine. One filling of the oil-reservoir will last half a shift. In case the rotating mechanism should not receive sufficient lubrication from the interior, provision is made in the upper head whereby it may be oiled when necessary. In the make-up of the machine only the best and fitted materials are used. The workmanship is of the best, and absolute interchangeability of parts is assured. The machine is manufactured by the Chicago Pneumatic Tool Company.

Commercial Paragraphs.

THE AMERICAN SPIRAL PIPE WORKS of Chicago, through their Denver office, recently sold to the Peninsular Hydraulic Mining Co., of Nome, Alaska, a large amount of 26, 24, and 22 in. pipe for use on their placer property.

THE GOLDEN WEST PLATING WORKS, of San Francisco, have moved to larger quarters at 353–361 First St., where they have excellent facilities for manufacturing amalgamating plates of the highest grade.

THE J. GEO. LEYNER ENGINEERING WORKS CO., of Littleton, Colo., recently made a shipment of 23 electric hoists to Goldfield, Nevada. The smallest was 20 h.p. and the largest 80 h.p. On account of congestion of freight between Denver and Goldfield, one of the cars was shipped by special train in order to insure prompt delivery of machinery. They also recently shipped to the Kansas City Southern Railroad Co., for their shops at Pittsburg, one 1,600-ft. air-compressor; this order was placed by Arnold & Co. of Chicago; also one 400 cu. ft. and one 300 cu. ft. air-compressor with boiler equipment to the Governor of Sonora, in Mexico; this last is to be used for pumping water for irrigation purposes; two steam-hoisting plants to the Cananea-Bisbee Development Co., at Naco, Arizona; one 25-h.p. electric hoist to La Providencia Mining Co., Guanajuato, Mexico; and during the month of January seven compressors were shipped to Japan with full complement of water-Leyner and Leyner air-drills.

Publications Received.

'Summary of the Mineral Production of the United States in 1905.' U. S. Geological Survey, Washington.

'The Progress of the Mineral Industry of Tasmania,' for the quarter ending September 30, 1906. Compiled by W. H. Twelvetrees, Government Geologist.

PRODUCTION OF GAS, COKE, TAR, AND AMMONIA, at gas works and in retort coke ovens, in 1905. By Edward W. Parker, U. S. Geological Survey.

ILLINOIS GEOLOGICAL SURVEY. Administrative report for 1906, by H. Foster Bain. This is a good example of the work done by an efficient State Survey.

'The Decomposition of the Feldspars,' by A. S. Cushman and Prevost Hubbard. U. S. Department of Agriculture. Office of Public Roads. An interesting paper, of practical use.

Trade Treatises.

United Iron Works of Oakland, Cal., sends Folder 28, descriptive of their Eclipse centrifugal pumps. Besides general illustrations of step-pressure pumps, it presents a novel elastic system of mine drainage, also methods for elevating mill tailing and for dredging with sand and gravel pumps. It will be sent to interested parties upon application.

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Editorial.

THE American Association for the Advancement of Science meets at Chicago this year and the Geological Society of America will meet at Albuquerque. Both meetings will afford an opportunity for the contact of ideas from the East and the West.

AT LONDON, in the boom days of the past, they called the South African department of the Exchange, the Kaffir circus. At Boston there is a notoriety-hunting spoofer named Thomas W. Lawson. The London circus will be incomplete until it secures the services of the Boston clown. He has made advertising an absurdity, and finance a folly.

THE annual report of the Portland Gold Mining Company, just to hand, gives the names of the subordinate officers at the mine and mill, as well as those of the president and directors. This is eminently fair and proper. A faithful shift-boss is often of greater value in the operation of a mine than a figure-head director. A good executive at the head and an efficient staff are equally necessary, and it is an important part of the duties of such a chief to see that he has trustworthy subordinates.

THE APPEAL for $7,500,000 needed for the University of Cambridge has drawn attention to the indifference of wealthy Englishmen to the financial necessities of the universities of their country as compared to the lavish generosity of American plutocrats. Similarly, the fact that the British Empire, which controls the larger part of the mining industry of the world, has no properly endowed school of mines is another feature that is hard to reconcile with the genuine philanthropy and public spirit of the best kind of Britisher. One would think that they would do something handsome for a historic institution like the Royal School of Mines.

ACCORDING TO certain authorities, America is suffering from an excess of prosperity and in evidence of it they point to the scarcity of labor and fuel, the breakdown in railroad transport, and the lack of money for construction, culminating in a shrinkage of values on Wall Street. Even a restricted currency is blamed. Meanwhile it will be left for others to realize that the combined credit of the country cannot finance simultaneously both the tremendous industrial development and the excessive stock speculation. Those gamblers on Wall Street, New York, and on State Street, Boston, appear to be using too much of the available cash and credit.

A RUSH to new alluvial diggings in Victoria proves that all the cream has not been skimmed. Near Tarnagulla, itself about thirty miles from Bendigo, some rich shallow alluvium has been uncovered and several large nuggets have been obtained. The biggest was found on

December 18; it weighed 960 ounces and was 16 inches long, 10 inches wide, and 4½ inches thick. It lay "upon a sandstone bump" and in "puggy ground." 'Pug' is the Australian's equivalent for 'gouge.' Two nuggets weighing 387 and 373 ounces, respectively, were also found, a few feet below the surface. The mining excitement which it has occasioned is called the Poseidon rush.

IT IS PROBABLE that Mr. C. Willard Hayes will be selected as Director of the Geological Survey. While he has been blamed by some for the rather tactless letters that caused several wellknown men to sever their connection with the Survey recently, and while he is not as fully in touch with the Western mining regions as one or two other men that have been mentioned for the post, nevertheless, it is but just to state that he is held in high esteem by his colleagues, who will, therefore, welcome him as their official chief; other men also who are well informed, regard Mr. Hayes as well fitted to succeed Mr. Walcott. The position is one demanding administrative ability more than anything else, for the Survey has become a big bureau quite different from the small scientific corps with which it started under Clarence King. Mr. Hayes is likely to get cordial support from the men associated with him, and this will go far toward ensuring a successful administration. He succeeds to a noble heritage, with great power for good in making geology useful, and we hope that under his direction the Survey will continue to be in the future, as in the past, a scientific guide of the utmost value to the industry of mining.

EVEN THE 'wild cat' has turned in his lair and is emboldened to present an angry front. In the recent issue of one of the newspapers that advertise shady promotions, there is the cartoon of a 'wild cat' facing a number of dogs, representing the magazines that have attacked fraudulent mining practices. In this picture the 'wild cat' looks decidedly belligerent, and is represented as howling that he is "the pioneer of all legitimate industry" and in the description underneath it is asserted that the tendency is to label every mining prospect a 'wild cat' unless it has produced a great deal of money, or is "owned by the Guggenheims." This outburst is the result of a series of attacks on the worst forms of financial chicanery, appearing in certain magazines and written by men who lacked such experience in mining as to make their criticisms effective. The result has been that the local papers have found it easy to retort and everyone of the ephemeral sheets that pose as financial advisers on mining stocks has been enabled to plume itself on a superior knowledge of mining operations. And so the 'wild cat' has won some mistaken sympathy, the promoters of hungry prospects having claimed that every young mine is now labeled in this unkindly fashion until it has been developed into a bonanza. This is nonsense; of course, mines must have a beginning and each starts as a small hole in the ground, the possibilities of which are uncertain, but the mischief done arises from the fact that the promoters of the flood of wretched schemes that are now being advertised in the press offer uncertain prospects at the price of proved mines, and small mines at the valuation of big ones, and worthless claims as rich properties. A 'wild cat' is not an unpretentious prospect, it is a vicious fraud. Among the signs by which you may know him are these: "Mountains of ore;" "Getting richer with depth;" "Veins are coming together;" "Richer than the Calumet & Hecla, or the Homestake;" "Will pay when a mill is built;" "Has been experted by the well-known Colonel Smith and Professor Bunkum;" "An investment, not a speculation;" "Double your money in two weeks."

Calumet & Hecla.

The enlargement of the property of the Calumet & Hecla Company by the purchase of a major interest in the Osceola and Allouez companies is an important event. Control of the Centennial is also stated to have been secured. The Allouez is a young mine that has been a success from the time the Kearsarge amygdaloid copper lode was cut at 1,400 feet, while the Centennial is a property with a checkered history that has recently become profitable by getting the Kearsarge lode at 3,000 feet, after many vain efforts to win dividends from the Calumet conglomerate and the Osceola amygdaloid lodes. The Osceola also found the Calumet conglomerate unprofitable, and then exploited the amygaloid bed to which it gave its name. In this case likewise the future of the mine is largely dependent on the Kearsarge amygdaloid, which has been developed by the Osceola through several shafts. The work of the last five years has emphasized the preponderating importance of the Kearsarge lode, which is now the source of remunerative production in a large group of mines, notably the Wolverine and the Mohawk, besides those above mentioned. The Calumet & Hecla owns other property in Keweenaw county, and is doing exploratory work in several places, so that collectively it now controls an enormous extent of copper deposits of a profitable kind. This means that it will continue to be the decisive factor in American copper production; by the acquisition of new mines to balance the gradual exhaustion of the Calumet & Hecla itself, the company will be able to maintain an aggressive position against any attempt to control copper prices by the Amalgamated people, that is, Standard Oil. Incidentally the change in the management of the Osceola will take the selling of its copper from the United Metals Selling Co., an Amalgamated concern; for the Calumet & Hecla has its own selling agency. The United Metals Selling Co. has been a useful tool of the Amalgamated in some of its predatory enterprises, so that this change is not to be regretted. It is pleasant to note that locally the increasing influence of the Calumet & Hecla management is viewed with favor. Although secretive in regard to its technical practice, and therefore rather ungenerous to professional men and to those who try to win a reputation by publishing useful information, the management has been always recognized as honorable and humane, setting an undoubted example in these respects. In a day of reckless finance and corrupt practice, it is a matter of some importance that a company like the Calumet & Hecla should retain leadership in the Lake Superior copper region. Long may it prosper.

A Professional Matter.

A nice question has arisen in connection with Greenwater. If a mining engineer examines a mine or a number of mines in any given district, should he express his conclusions concerning the district gratuitously in print? For instance, Pope Yeatman, Seeley W. Mudd, and Walter P. Jenney have examined Greenwater in behalf of various clients. It is a notorious fact that a great deal of stock-jobbing of the worst kind is being perpetrated on the basis of some of the copper prospects in that region. Ought these engineers, or others similarly informed, to warn the speculating public? We shall try to answer this self-imposed query, in the hope that some of our readers will help us to clear a nice point in professional ethics—if ethics be not too big a word. In the first place, the engineer gets his information at the expense of his client, and he cannot make use of it without the client's permission—at least he should not do so for a reasonable period, and then only if the publication does not work harm to the interests of that client. As a client usually ceases to have any interest in a camp after he has received an unfavorable report, it is evident that he may be expected to grant permission for publication. If, on the contrary, the report is favorable, it is to the interest of the client to have kind things said of the camp—provided he has secured all the property that he wants. If he is planning to acquire more, he will want things kept very quiet. So much for the client; now for the engineer. Should he express an opinion in print, the client having no objection? One man will argue that it is foolish to give advice for nothing to people whom he does not know, and another will add to that point of view that it is a mistake for the engineer to risk his reputation by committing himself publicly to any decided opinion. To this we would answer that while it is true enough that people who put money into mining schemes without professional advice deserve no consideration from the professional man; and although the public that runs after wild schemes does not contribute to the living expenses of the mining engineers, and therefore no sympathy is likely to be wasted by the latter, nevertheless, this is the argument only of the sort of man that never heard of civic duty or any other code save the one that is emblazoned with the shekel. The public may not deserve much of us in these matters, but each of us owes something—and something big—to the community in which we live. That is the basis of civilization. However, let us come nearer home. The idea presented to many professional men is that it is a mistake to run the risk of a blunder by publishing an opinion except for a fee; the fee pays for the risk. You may be wrong and then you have injured your reputation. But, my dear Sir, you never make a reputation unless you risk it. Reputations are made by the exercise of good judgment and the expression of correct conclusions; if you are to avoid responsibility, go and run a chicken ranch. The engineer is a scientist and a citizen; as a scientist he states the truth and as a citizen he recognizes his obligations to the community; if he is untruthful or if he is neglectful of his civic obligation, he is a renegade to his profession. And this is no exaggerated language; those of us who have received a technical education and a scientific training owe it to our self-respect to have higher notions of duty than a hod-carrier or a State legislator. It is the old slogan "*Noblesse oblige.*" And it has its more practical application; for reputations are undoubtedly made by the expression of decided opinions that prove right, and one of the best ways of getting away from the undistinguishable crowd, away from the 'and others' and the 'also ran,' is to publish a correct diagnosis of a new mining district, whether favorable or unfavorable does not matter, as long as it is based on sufficient evidence.

Zinc Ores.

The recent discussion as to whether the silicate and carbonate of zinc should both be admitted free of duty under the designation of 'calamine' has been decided in the affirmative by the Board of General Appraisers of New York, in opposition to a ruling of the Secretary of the Treasury made by him a year ago. At the same time it was decreed that the sulphide (blende) is not a metallic substance under the meaning of the new law, and that it may enter the United States without penalty. This will please mine owners in Mexico, without doing injury to anyone on this side of the border. According to the revised tariff of 1896 an *ad valorem* import duty of 20 per cent was placed on all minerals that contain 'metallic' values, but a specific exception was made for 'calamine' ores. It was contended by several experts that only the silicate ore is 'calamine' in the correct meaning of that term. Other experts testified to the contrary. In the end it was decided, as stated, that the old interpretation of the term 'calamine' was intended by the framers of the law to include both of the oxidized ores, which occur in close association and are difficult to distinguish. Incidentally, we note from an article by Mr. Jesse A. Zook, in the Joplin *Globe*, that the zinc miners of Missouri were not behind the movement to shut out the Mexican and Canadian ores, but that it was instigated by a metallurgist representing a European smelter, to whose interest it was to spoil the American market for the Mexican and British Columbia ores.

It is satisfactory that the matter has been settled. 'Calamine' becomes a trade term for the two minerals known in science as 'calamine' and 'smithsonite;' in the same way 'pyrites' is used as an industrial equivalent for the mineral 'pyrite,' and 'barytes' for 'barite,' the old form doing duty in commerce after it has been discarded in mineralogy. It is a curious fact that while in America 'calamine' stands for the silicate, and 'smithsonite' for the carbonate, the reverse is the case in England and Germany; there the silicate is 'smithsonite,' and the carbonate 'calamine.' Those who learnt their mineralogy in Europe, have often been confused by this transposition. Prior to 1846, when Dana transferred 'calamine' to the hydrous silicate of zinc, the nomenclature was the same on both sides of the Atlantic.

Personal.

PERCY L. FEARN is in Costa Rica.

CARL HOFFMANN is at Mexico City.

EDGAR A. COLLINS is visiting San Francisco.

CHARLES BUTTERS is expected back from Mexico.

ERNEST WILTSEE is investigating mines in Peru.

H. SPANGLER, of Denver, is now at Hercules, Nevada.

JOHN S. P. SAMBORNE has left London to proceed to Mexico.

HOMER WILSON of Goldfield, Nevada, has been in San Francisco.

H. S. CHAPMAN, formerly at Bodie, is now at Greenwater, California.

J. B. RISQUE, manager of the Utah Consolidated, is in New York.

J. LEWIS TONKIN is now with the Mysore Gold Mining Co. in India.

H. A. LEE now resides at Salt Lake City, his office being in the Dooly Block.

JOHN C. MONTGOMERY, of New York and Denver, spent a few days in San Francisco.

J. K. TURNER is consulting engineer to the Combination Fraction Co. at Goldfield, Nevada.

GEORGE A. SCHROTER, consulting engineer of the Dolores mine, Mexico, is visiting San Francisco.

I. B. EMPSON, metallurgist for the Guanajuato Development Co., has been visiting Pachuca, Mexico.

ARTHUR G. COLEMAN is on his way from Australia to inspect the Raub mines in the Malay States.

LEWIS T. WRIGHT, the manager of the Mountain Copper Co., is leaving for a short holiday in England.

JUAN F. BRANDES visited San Francisco, on his way to Sonoro, Mexico. He returns to Europe in April.

A. CHESTER BEATTY will go to Brussels shortly, in connection with the Congo business of the Guggenheims.

R. W. FOSTER, recently superintendent for the Sevier Consolidated Mining Co., Utah, has gone to Cobalt, Ontario.

J. B. PITCHFORD, recently mechanical engineer at the Randfontein mines, Johannesburg, is now living at Berkeley, California.

E. P. MERRILL, of Virginia, has been appointed general manager of the Real del Monte y Pachuca properties, at Pachuca, Mexico.

G. M. GOUYARD, of Denver, has been appointed consulting engineer and manager of the Bonanza Belt Copper Co., at Johnson, Arizona.

F. W. BAKER, chairman of the Venture Corporation Ltd., has been dangerously ill. He is, we are glad to state, recovering satisfactorily.

HAROLD V. PEARCE, manager of the Argo smelter at Denver, who has been taking a holiday at Monterey, spent a few days in San Francisco.

JOHN M. DAUGHERTY, of Omaha, and THOS. A. VARDEN, of Sacramento, Cal., both of the American Mining & Development Co., are at Salt Lake City for a few days.

CHARLES S. MORRIS has resigned as superintendent of the Utah Consolidated smelter, near Salt Lake City. He will be succeeded by ALEXANDER LAIST, formerly of the Washoe smelter at Anaconda, Montana. Mr. Morris was with the Utah Con. for about four years. He goes to the Cerro de Pasco mines in Peru, South America, to occupy a similar position under ROSCOE H. CHANNING.

Dividends.

On March 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 114 of $180,000. This makes the amount of dividends paid since January 1, $540,000, and total to date $8,406,000.

[We shall be glad to receive notification of dividends declared by other mining companies.—Editor.]

Books Received.

'Report of the Director of the Mint' upon the production of the precious metals in the United States during the year 1905.

U. S. GEOLOGICAL SURVEY.—'Black Sands of the Pacific Slope in 1905' by David T. Day and R. H. Richards. This is a pamphlet of 80 pages, describing the experiments made in the concentration of the heavy sand occurring in placer deposits.

'The New Zealand Mining Handbook.' Issued by the Minister of Mines. Edited by P. Galvin. This is a volume of 585 pages, giving a general account of mining operations in New Zealand. It is profusely illustrated and full of interesting matter.

'The Six-Chord Spiral,' by J. R. Stephens. A little book containing complete information regarding the location and construction of spirals, with especial reference to the six-chord spiral, which is an ordinary multiform compound curve of six arcs of equal length, whose degrees of curvature increase in the order of the natural numbers, and so arranged that the seventh arc always exactly coincides with the main circular curve. The Engineering News Publishing Co., New York. Price $1, board; $1.25 cloth.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, March 7.

Argonaut	$4.75	Bunker Hill	$2 50
Con. Virginia	0.93	Savage	0.80
Mexican	0.86	Sierra Nevada	0.82
Ophir	2.70	Yellow Jacket	1.10
Belmont	5.25	Midway	2.05
Combination Fraction	4.50	Montana	3.75
Goldfield Con	9.00	Mohawk	17.50
Jim Butler	1.05	Red Top	4.30
Jumbo	4.25	Sandstorm	0.65
Jumping Jack	0.14	Silver Pick	1.41
Manhattan Con	0.80	Tonopah Ex	4.40

METAL PRICES.

By wire from New York.

Average daily price in cents per pound.

Date	Copper (Electrolytic)	Lead	Spelter	Silver
March 1	21⅞	6	6⅞	69¼
" 2	25	6	6⅞	69⅜
" 4	25 1/16	6	6⅞	69⅛
" 5	25 1/16	6	6⅞	69⅛
" 6	25 1/16	6	6⅞	69⅛
" 7	25 1/16	6	6⅞	68⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	February 28. £ s. d.	March 7. £ s. d.
Camp Bird	1 6 6	1 5 9
El Oro	1 10 6	1 8 6
Esperanza	2 6 3	2 5 9
Dolores	1 18 0 ex div.	1 17 0
Oroville Dredging	1 0 0	0 19 6
Stratton's Independence	0 3 0	0 3 0
Tomboy	1 18 6	1 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Feb. 28.	March 7.
Bingham Central	1½	1¾
Boston Copper	29⅝	29
Calumet & Arizona	190	179
Cumberland Ely	11⅝	10½
Dolores	9¾	9¼
El Rayo	5⅛	5¼
Guanajuato Con	4¾	4¾
Giroux Con	10	9½
Greene Con	30⅛	27½
Nevada Con	17⅜	16⅜
Nipissing	13⅜	12⅜
Tennessee Copper	50	51
Tonopah Ex	4½	4½
Tonopah-Belmont	5	5¼
Tonopah	16	17¾
United Copper	71¼	76⅜
Utah Copper	38	36

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Mining Summary.

ALASKA.

The Hadley smelter is again operating at full capacity, the mines near the town are being worked, and both the mines and smelter are advertising for men.——The mills at Treadwell have started again, a shipload of coal having arrived. ——It is announced that a smelter with a capacity of 500 tons per day will be built on Resurrection bay near Seward and will be ready for operation by the time the Alaska Central railroad reaches the Matanuska coalfields, which is expected to be early next year. This announcement is made by J. E. Ballaine, who attended a meeting of Alaska Central directors and other railroad officials, in Chicago. The smelter company is an independent corporation, but is being projected jointly by the men behind the Alaska Central, and the Hubbard Elliott and the Knight Island copper companies.——The owners of the Groff mine at Chichagoff will build a five-stamp mill in the spring. Ten men are working at the property, and ore is shipped regularly to the Tacoma smelter that is said to average $150 per ton. Drifts have been run on the vein for 200 ft.——It is reported that the Detroit-Yukon and Canadian-Klondike mining companies, composed of Detroit capitalists, are closing negotiations for the amalgamation of the two companies with the Guggenheim Exploration Co. These two companies were formed five years ago, and have been accumulating gold-producing properties in the Canadian Yukon until they now own 45 square miles.——Estimates place the probable production of the Tanana for this winter and summer at $12,000,000, which will mean an increase of $3,000,000 over last year. It is believed that the Chatanika will prove the richest portion, as an ancient channel is being traced there from Cleary creek.

ARIZONA.

YAVAPAI COUNTY.

Improvements in the United Verde mine and smelter are constantly being made. The capacity of the smelter has recently been increased, and the furnaces are being enlarged. Already there are five 500-ton furnaces in the plant. The most urgent problem at the mine is how to handle the immense product. The amount of ore now blocked out is probably enough to last for 30 years.—— Mining operations throughout the whole Jerome Verde copper belt are very active. A number of promising properties in the immediate neighborhood of the United Verde are being developed. The North Verde, the Verde Grande, the Cleopatra, and the Black Hills group of claims are making the most satisfactory progress.

CALIFORNIA.

AMADOR COUNTY.

The Fremont mine paid its first dividend last month, amounting to two cents per share. The capitalization is 200,000 shares. From the present outlook, the mine should continue to pay dividends at regular intervals.——The Hazard mine is to be worked as soon as supplies can be secured. This property is situated between the Fremont and Bunker Hill mine. J. R. Poundstone is in charge.—— The Keystone at Amador City is still idle, on account of the breakdown of the air-compressor. Some trouble is experienced in keeping down the water, with the machinery available. A number of the miners are leaving the camp.

NEVADA COUNTY.

(Special Correspondence).—Since the heavy storms are practically over, it seems that every part of Nevada county is receiving more than the usual amount of attention, and activity is in evidence everywhere in the way of mining.—— A number of mining men are in the field examining properties.—— An important strike has been made in the Telegraph mine, 44 miles north of Nevada City. Ore encountered runs as high as $1,000 per ton. The character of the lode is the same as that of the Tightner mine of Alleghany. The chief development is a long tunnel, with modern surface improvements, $100,000 having been spent upon the property in the last five years. The gravel deposit has given rich returns in the past, but the new strike is on a quartz vein. This was a blind lode, for which the company has been making a long search.——Work has been resumed upon the Blue Tent gravel mine on the South Yuba river, six miles above Nevada City, under the direction of Oscar Jones. A tunnel is to be run to develop a large tract of virgin channel which cannot be reached through old workings. Many years ago the Blue Tent was a prominent hydraulic mine of the county, but since an embargo was placed on that industry, has been worked as a drift mine. It has produced many hundreds of thousands of dollars, with only a comparatively small amount of the present workings developed.—— A seven-foot lode of ore has been encountered in the shaft of the Murchie mine. As far as can be judged by the work done it is an entirely new discovery.—— A rich strike has been made upon the Morning Star mine, held under bond by the James Brothers, on what is known as the Mother Mitchell ranch, a few miles west of Nevada City. A prospect shaft was sunk 30 ft. on a lode. It was in the drift from this shaft that the rich

California.—Showing Position of the Counties.

rock was found. The lode is from 15 to 18 in. wide, thickly peppered with gold, and gives promise of running well.—— A rich strike has been made in the old Mountaineer mine, about a mile south of Nevada City. Superintendent Campbell states that the new shoot is making for the Customah mine. This makes the discovery an important one for that mine, as well as the Mountaineer.—— Martin Vanberg, of Washington, is developing a valuable property on Canyon creek, about 25 miles above Nevada City. His property adjoins the Arctic, which is proving a splendid producer, and upon which a new strike has recently been made. The vein on the Vanberg claim is said to be from 15 to 20 ft. wide, well defined, and averaging $5.20 per ton.——The famous Tightner mine still continues to make rich strikes. The last one made was in the south drift about 100 ft. from the shaft.—— The Giant King mine, about 25 miles from Nevada City, and near the town of Washington, is being opened by the Co-operative Exploration D. Co., and gives promise of developing into one of the biggest low-grade propositions in the State. A tunnel 570 ft. long has been driven into the hillside, which cuts through the lode. The vein is 97 ft. in width from wall to wall, every foot of it being quartz. It is expected a new 20-stamp mill will be erected upon the property by the first of next August.

Nevada City, Mar. 1.

SISKIYOU COUNTY.

The Great Johnnie mine at Quartz valley, formerly known as the Two Bit, and now owned by David Bedit and J. W.

Eubanks, is showing up well. Two tunnels have been driven, each over 100 ft. long, and a good vein is exposed. ——It is understood that the Medina company has another extension of one year on its bond of the mines at Oro Fino, and will continue work.——The coal mine east of Medford is showing up well. A nine-foot vein is reported, the permanency of which has been proved. The owners of the Blue Ledge mines are interested in this property.——The mill of the McKinley company, on Humbug, is running again.—— The Mt. Vernon Mining Co. has let a contract to run a long tunnel on its lower vein, which is about three feet wide.—— The new pump, hoist, and ore-bin at the Sheba mine on Patterson creek are about finished, and all machinery will soon be in place. This company is now supplied throughout with a splendid new equipment, and the mill will be running in 30 days. N. E. Graves is the superintendent.——Tunnel No. 5 in the Helena quartz mine, near Callahan, has reached the ledge and crossed it. The new cyanide plant has been completed, in spite of the scarcity of labor, and the milling operations will soon start.——The Fernandez hydraulic mine at Cherry creek has commenced operations with two giants, and the Sunset, just below it and near Deadwood, is running one giant. There is plenty of water and a long and prosperous run is expected at each of the properties.

The Hawkensville ditch, has been repaired across Yreka flats to Rocky gulch. The ditch covers some very rich ground, and will be used as long as the water holds out, which will be until about July.——The Spengler mine at the mouth of Humbug creek is being worked. Water is being used for hydraulicking and a good deal of ground sluicing is being done to uncover the richer gravel in order that work may be kept up when the water supply becomes low.

TUOLUMNE COUNTY.

(Special Correspondence).—There is promise of much activity at the North Star mine. Although it was contemplated to have the mill in operation, W. G. Phipps, the superintendent, has confined the work entirely to development, and good orebodies have been uncovered. At present driving south on the 200-ft. level is in progress.——Work is to be resumed at the Uncle Sam mine, near Arastraville, the coming week. Driving and sinking the main shaft will go on at the same time, and the ore extracted will be crushed in the Dreisam mill. The average width of the vein is 20 in., and it is expected the ore will go $15 per ton free gold.——The new incline shaft at the Confidence mine is down 370 ft., and sinking continues. A cross-cut is being driven toward the hanging wall at the 300-ft. level. A tramway 1,200 ft. long, running from the new shaft to the mill, was recently completed.——There is an unauthenticated rumor in circulation to the effect that ore of remarkable richness has been uncovered in the Soulsby mine, operated by the Bagdad-Chase Mining Co. Grading for a tramway to connect the Davidson shaft of the Soulsby with the mill is in progress.——The contract for extending the adit at the Jewel-Fay mine 100 ft. has been completed, and A. Davidson, of Fowler, Fresno county, is here making arrangements for continuing development work. The adit is 200 ft. long and exposes considerable good-grade ore. Some thought is being given to erecting a mill in the near future.——Development work was commenced a few days ago at the Turnback mine, situated near Tuolumne on the creek by the same name. Thirteen sacks of unselected ore from this property yielded $45 per ton. This test was made some time ago by local people who contemplated purchasing the property, but before they began negotiations in earnest for the purchase, others obtained the property by bond. The latter erected a two-stamp mill, but about the time of its completion dissatisfaction arose, activity ceased and the bond was forfeited. Recently, outside people acquired the property and are now developing it.——Work is to be resumed at the Duchess mine, situated near Parrot's Ferry.——A new body of high-grade ore has recently been uncovered in the Mt. Lily mine, near Columbia.

Tuolumne, March 3.

YUBA COUNTY

A careful survey has been made of the ground in dispute between the dredging interests of Oroville and the Anti-Debris Association, and an apparent settlement of the matter has been reached. The solution of the problem agreed upon, was the construction of a system of barriers along the outlets of the various ditches leading from the dredges to the river. Small settling reservoirs and dams will be constructed. No further action will be taken as far as the injunction suits are concerned, and the work of construction will begin at once, under the direction of an engineer of the Anti-Debris Association.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).— The Georgetown district is booming, and the working force will be trebled within the next 60 days. During the past week the Mendota group of claims has been transferred to a syndicate of Eastern capitalists, who are represented by J. L. Gordon, of Denver. The consideration is given at $350,000. A contract was awarded the first of this week for sinking the main shaft an additional 300 ft. As the lower four levels are filled with water, the pumps have been put into commission, and it is expected to have everything in readiness for breaking rock within 10 days. This shaft now has a depth of 1,200 ft. It is known that large orebodies exist below the fourth level, and the production promises to be heavy. A raise is to be put through from the Victoria adit level to the upper Frostberg workings, a distance of approximately 400 ft. The Mendota group has been one of the steadiest producers of this section for over a quarter of a century, and is the greatest lead and zinc proposition in Clear Creek county, if not in the State. The new company will start work upon a concentration plant with a capacity of 150 tons per day. John Old, of Georgetown, has been appointed resident manager.—— A rich strike has been made in the Silver Cloud workings, situated on Sherman Mtn. In running a drift for a distance of 70 ft. a two-foot body of lead ore has been uncovered. Stoping has been put under way and a record breaking production is promised.—— Work has been resumed on the Plato mine, situated on Griffith Mtn. The adit, in a distance of 85 ft., has been cleaned out and retimbered, and in the breast there is now showing a three-inch streak of ore which gives assays of 20 oz. gold per ton. Wm. Aldred, of Georgetown, is the owner.—— Shipments of concentrate were started this week from the East Griffith mill. The material is sold to the Georgetown sampler, and the manager of that institution states that the finished product is the cleanest that he has ever handled. The concentrate averages $55 per ton. W. D. Hoover, of Denver, is the manager.——Ground was broken this week for the new power-building and milling plant to be constructed by the Capital Prize company. Owing to the boiler giving out at the old plant it became necessary to suspend operations, but W. M. Cooper, the manager, states that he will have the new plant in operation inside of 60 days. The machinery has been ordered and is expected to arrive inside of two weeks.—— The Electric plant of the Two American Sisters Mining Co. is now furnishing power. The company's mill is running on full time, and a fine quality of concentrate is being turned out. Wires are being run throughout the Columbian Mtn. section in order to furnish power for a number of other large operators. J. J. White, of Georgetown, is the general manager of the enterprise.—— It has just been learned that the Arapahoe group of 12 claims and two millsites were purchased by the Transcontinental company. The deal was engineered by Rees C. Vidler, the general manager, $40,000 having been paid for the holdings. The heading of the Vidler tunnel is now nearing Arapahoe ground. The company's mill is running on full time, being fed upon ores found in the Flossie vein workings.—— A contract has been awarded by Gileen & Johnson for the driving of the adit on the Hidden Treasure an additional 100 ft. These holdings are situated in East Argentine, and lie in close proximity to the Arapahoe group.——A new and important strike has just been made in the Cliff mine, situated on Democrat Mtn. At a distance of 300 ft. from the portal of the lower adit, an 18-in. streak of 60 oz. silver ore has been uncovered. Blind drifts are now being run. As this is practically a surface pocket, a large output will undoubtedly result. Manager Chas. Estelle is employing a good force of men in carrying this

stope, as well as the one 800 ft. from the portal of the adit. —— The Lucky Hesperus is the scene of one of the richest strikes made in many years on Democrat Mtn. In running a cross-cut under the old workings a four-inch streak of 600 oz. ore has been exposed. For some time the operator had been following a body of quartz measuring four feet in width, and it is believed he has cut into one of the old-time bonanza pockets for which the mine was famous a few years ago.——Henry Seifried, of Georgetown, has bonded and leased to Wm. Morgan, of Idaho Springs, an undivided one-half interest to the Brazil group of 15 elaims, situated in the Freeland district. The bond calls for $10,000, and runs for two years. Mr. Morgan in turn transferred his privileges to the 3,006 Leasing Pool, whieh is being financed by Idaho Springs business men.—— Paul Raddatz has sold to A. H. Brunke, of Denver, the Fillibuster, and Fillibuster No. 1, 2, and 3 lodes, and the Three Friends property, situated on Silver Mtn. A company is now being organized, and an energetic campaign of development is promised for the near future.——The Colorado Central mine, with a production of $10,000,000 to its credit, is producing a heavy tonnage of ore. Ten sets of lessees are at work, and all are in pay-ore. The returns vary, running from 70 to 280 oz. silver per ton. F. A. Maxwell, the manager, is employing a good force of men, and is stoping on a big body of zinc in the Sleepy drift run from the Equator adit. The product is concentrated at the Santiago mill.

Georgetown, Feb. 28.

OURAY COUNTY.

The differences between the miner's union and the owners of the Gold Lion have been settled, and work is progressing at that property. The tunnel is now in about 800 ft., through heavy ground. Much water has been encountered.——The car of ore shipped from the Jonathan returned $7,660.——The Chipeta tunnel is going ahead at the rate of 75 ft. per week. It is in 1,600 ft., and when 400 ft. more is added, a raise will be run 150 ft. to the quartzite, where it is expected that a good body of ore will be encountered.

SAN JUAN COUNTY.

The Old Lout mine has been sold to George Crawford and associates, of New York. The group includes the Old Lout, Michigan Girl, and other claims, and is situated at the head of Poughkeepsie gulch, near Mineral Point. This property was located in 1876, and has produced $300,000 in silver, reaching its maximum output in 1884. Subsequently it was sold to a London company, which ran a tunnel 1,800 ft. in length, which never cut the vein. The ore was a complex one, carrying lead, zinc, copper, and bismuth.——About 40 men are employed at the Hamlet mine and mill. Some high-grade copper ore has been recently encountered.——The Gold Prince mill at Animas Forks is dropping 30 stamps. W. Z. Kinney is the manager.—— The Grand Mogul mill at Gladstone is running, following a period of inactivity. The ores of the Mogul are low grade and refractory, carrying lead, zinc, and iron, but the mill is handling it successfully.——The tunnel at the California Mtn. mine is in 800 ft. In another 1,200 ft. it will cut the Mountain Queen vein.——The Alethea mine, at Sultan Mtn., is one of the latest acquisitions of the Detroit & Colorado company. This property was worked 20 years ago by lessees. The property is being worked, and the vein, which has been narrow and rich, is increasing in size. A new compressor and other machinery has been ordered.——The Green Mtn. mill is being overhauled and remodeled. C. J. Garvin is manager.——The Henrietta mine is shipping to the Ross smelter, and the Gennessee is opening the road in order to begin hauling.——The Silver Lake mill is completed. It is built in two units, in order to treat Silver Lake ore and material from the Aspen group.

SAN MIGUEL COUNTY.

The heavy snows caused a break in the cable furnishing electric power to the pumping station of the Tomboy mill, at Ptarmigan lake, which resulted in a temporary shutdown of the mill. The line supplying power to the Camp Bird is also out of repair and giving a lot of trouble; and for some days there was no communication between Ouray and the outside world.——The uranium mill, near the western boundary of the county, has been idle for some weeks, awaiting the arrival of a new boiler. This plant has been treating ore running from 2 to 4% uranium. The ore is obtained from pockets, containing from a few pounds to several tons. The process consists of crushing, roasting with soda, leaching, and precipitation, the treatment being similar to that used at the Newmire vanadium mill.

NEVADA.

ESMERALDA COUNTY.

(Speeial Correspondence).—Blair is a new town at the terminus of the Silver Peak railroad, which was built last fall from Blair Junetion, on the Tonopah & Goldfield railroad, into the Silver Peak and Red Mountain mining districts. Blair is three miles north from the old town of Silver Peak. It has water and sewer systems, electric lights; and a hotel having modern appliances is nearly eomplete. On a saline flat to the east are hot-water springs and the plan is to bring this water at its high temperature into the buildings for domestic use. On the same salt flat is the crater of an extinet volcano, rising to approximately 1,000 ft. above the surrounding plain. To the west are the Silver Peak Mtn., a range rising from 4,000 to 6,000 ft. above sea-level, trending nearly north-south, and which is made up of limestone and sehist. There are also dikes of diabase, cutting through the country. Locations were made and mines opened here nearly 50 years ago. Perhaps the most noted among them were the Vanderbilt and the Drinkwater, both of which operated stamp-mills. The Drinkwater was financed and operated by Samuel J. Tilden and associates, of New York, and the old workings, roads, and buildings, whieh they left, are today interesting reminiscences of that historic period in Nevada.——The revival of mining in Silver Peak range dates from 1905, when the great power-transmission line was stretched from Bishop ereek, California, to Goldfield and Tonopah. Silver Peak was in the path of this line and enterprising parties, seeing electric power at the door of the old district, took steps to re-open the mines and erect mills. The Pittsburg & Silver Peak G. M. Co. acquired large holdings along the strike of one of the prineipal vein-systems of the range, including the old Drinkwater mine; installed two air compressors, both electrically driven, and started work with air-drills. The same company built the 17 miles of railroad into the camp from the main line, over which trains have been operating since last October. A millsite has been seleeted at Blair, the exeavating and mason work are in progress, and the equipment for a 100-stamp mill and eyanide plant is on the ground, most of the maehinery having been furnished by the Power & Mining Machinery Co., of Milwaukee.—— Equipment for a 2½-mile aerial tramway line has been ordered from Leschen & Sons, and this will be erected to convey the ore from the mine to the mill. At the upper terminal of the tramway, three erushers will be installed to reduee the ore to 1½-in. size before it is conveyed to the mill. The crushers are on the ground. The mill will be built in three seetions, for stamps and plates; classification; and cyanidation. The ore is a gold-quartz and it is ealeulated that 50 to 60% will be recovered by amalgamation. The pulp after passing over the plates will undergo settling, classifying, and dewatering, effecting a separation of the sand from the slime. The sand will be cyanided in the usual way, the slime to be eyanided with Merrill's slime-filter presses. The mine is opened by a system of cross-cuts and adits. The main working level, which cross-cuts to the vein, is being double-tracked and equipped for eleetrie haulage. This leads into the recently opened section of the mine and these new workings will be connected with the old and extensive workings of the Drinkwater mine. The erushers and upper terminal of the tramway will be established near the portal of the main working level. While the two bases of operation are widely separated, the workings are considered on the same vein. M. L. Effinger is managing director for the company; J. L. Freeburn, general manager; A. J. Logan, superintendent. Geo. O. Bradley is consulting mechanical engineer, and C. W. Merrill, eonsulting metallurgist.——The Silver Peak-Valcalda M. & M. Co., in which O'Meara Bros. and J. T. Lynch, of Salt Lake, are in control, has the Valcalda mine, situated higher

on the range than the Pittsburg. Its holdings cover a quartz lode, which dips to the west at 25° and ranges in width from 16 to 25 ft. The vein carries gold, which occurs partly free and partly in pyrite. The property is opened by an incline conforming to the dip of the vein, with drifts run both ways in ore from 100-ft. stations. The present depth of the incline is 350 ft. Equipment is on the ground for a 10-stamp mill and cyanide plant. This includes a tube-mill for re-grinding the pulp after it leaves the amalgamating plates. It will then be cyanided in connection with a Hendryx agitator. The mill will be erected as soon as possible and it is expected to be put in operation by June 1. An air-compressor is in use for drill work, being electrically driven. All the power used here is derived from the Bishop creek electric line which crosses the country at the old town of Silver Peak. The entire property of the Valcalda company is under the superintendency of Curtis L. Knight, of Salt Lake City.

Silver Peak, Mar. 1.

(Special Correspondence).—The Mt. Grant district, 50 miles south of Yerington, and four miles from the east fork of the Walker river, has a new camp which is being explored by Dr. B. A. Burger and associates of San Jose, Cal. Ore has been found in a contact vein in lime and porphyry. The ore is a quartz-porphyry, carrying gold, silver, and galena. This locality is well watered and timbered. Parties interested contemplate erecting a small stamp-mill, with plates and concentrators.

Yerington, Feb. 22.

(Special Correspondende.)—The Nevada-Rockland M. & M. Co., eight miles southeast from Pine Grove and 50 miles south of Wabuska, the nearest railroad station, has a well-defined vein in rhyolite and diorite, carrying gold ore in a quartz gangue. The mine is opened by three adits, all connected, and a 100-ft. winze from the lowest level. There is said to be over a mile of underground work. A five-stamp mill was operated for some time and now a new milling plant is being erected, having crushers, rolls, screens, and cyaniding equipment, which will have a capacity of 100 tons per day. C. I. Baxter is manager, and M. M. Mendenhall constructing engineer. The Colorado Iron Works is furnishing the equipment.

Wabuska, Feb. 23.

LINCOLN COUNTY.

(Special Correspondence).—The amount of work done on the Annette property proves it to be the continuation of the vein cut in the Spokane shaft and owned by the Southern Nevada M. & M. Co., which has the same character of copper-stained ore on the surface, and also in the cross-cut.—A seven-inch Cornish pump has been ordered for the Drake shaft on the Quartette Mining Co., with a capacity of 200,000 gallons per day. These workings are on the Hidden Treasure claim adjoining the Cyrus Noble property.——Activity is shown on the Gold Beam and Majestic Bull Frog groups in the northern part of the district; a depth of 80 ft. has been reached on the Gold Beam, where some good copper and iron-stained ledge matter has been encountered.——At the Red Cliffe mine, situated about two and one-half miles east of Searchlight and adjoining the Boston group of the Quartette Mining Co., a recent discovery of high-grade ore has been made. The ore was first found in a shaft some 80 ft. deep, and the indications were that the shaft had cut the extreme western end of the ore-shoot in the vein. Since then the owners, I. F. Smith and John Jarvis, have opened a vertical shaft to the east of the original strike and at a depth of about 30 ft. struck ore. The quartz shows free gold and the general run of the vein is good. Sufficient development work has been done to show the hanging and foot-walls.——Arrangements are being made to resume operations on the Golconda.——The property of the Searchlight Gold Dollar adjoining the Golconda and Gold Dyke mines, will soon be in active operation; advices from New York state that they are arranging to contract the work of sinking to the water-level.——Good ore has been encountered while drifting eastward from the 300-ft. level in the Venus mine belonging to the Black Hawk Co. of El Dorado cañon. This same company is installing new machinery on the Rand property in the same section.——The Searchlight-Wyoming M. & M. Co. has encountered a big flow of water at the 300-ft. level, where it is cutting a station, and intend to cross-cut north to the vein and resume sinking after the pumping plant has been installed.——It has been announced that the Searchlight-Barnwell Railroad Co. will reach Searchlight April 1, and all the business men and citizens are preparing to celebrate on that day. They are now working a force of 400 men and the remaining distance to be covered with steel is eight miles.

Searchlight, Feb. 21.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—The Saginaw Mining Co.'s property is situated about eight miles northwest from Custer. At a recent meeting new officers were elected. L. P. Woodberry retired from the presidency, being succeeded by L. W. Herber. The directors are: Louis Hahn, H. N. Wagg, Ben Eleber, and Geo. S. Thompson. The meeting was held in Chicago on Feb. 4. The property consists of 20 claims, upon which good gold-bearing veins have been exposed by open-cuts and shallow shafts. The Saginaw mine has a shaft down about 400 ft., and drifts cut three veins of good ore, the largest one being 13 ft. across, and averaging about $10 per ton gold. The mine is well equipped with buildings, and a good steam-hoist, and the company announces its intention to put up a mill of 100 tons capacity during the coming summer. The Custer & New York Mining Co., formerly the Newark, has been erecting buildings and preparing for deep sinking. They are at present cross-cutting the vein by driving on the 100-ft. level. Chas. Waite, the president, is now in the East to purchase machinery for the mine. Dan Baker is superintendent.—— The mica factory belonging to the Westinghouse Electric & Mfg. Co. is running full capacity, and employs about 20 girls and boys, trimming, splitting, and preparing the mica for shipment to Pittsburg. It employs 20 men at the mine, and is taking out about 5,000 lb. of mica per day. J. Gurten is in charge of the factory, and Joseph Pyne is superintendent of the mine.—— Oscar Alpetter, of Milwaukee, and R. B. Martin, of Madison, Wis., were here on Feb. 14 looking at the mica mines, with a view to establishing a depot for the purchase of the product of the small producers in this vicinity. For this purpose a meeting was called at which all the owners were invited to discuss the subject. It is the intention to carry out this plan. Fifteen owners of mica mines attended the meeting, and the conference was satisfactory.

The Ivanhoe is running full blast and showing up well. Herman Ratte is the superintendent.—— The Clara Belle Co. is driving on the 250-ft. level in the new vertical shaft to strike the orebody in the old incline. It is daily expected to strike the vein, when the mill will again be started. Frank Hebert is in charge.—— The mills running on the silicious ores of the Bald Mtn. district are closed down on account of the strike.—— The Homestake, with its 1,000 stamps, is running, and has never had a strike.——The Branch Mint Mining Co., whose property is near Galena, 12 miles east of Deadwood, has about completed the 200-ton plant. The railroad which connects the mine and mill is five miles in length, and it is announced that they will continue it on to Deadwood in the spring. This road will pass near the Two Bit, Golden Crest, Lexington Hill, and Spruce Gulch mines, and will be a boon to the district. There seems to be no immediate prospect of an agreement between the mine owners and the miners in regard to the strike now on, and Deadwood feels the strike most keenly.

Custer, Feb. 29.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Winnepeg Mining Co. will extend its operations on the Hawkeye group of claims and is hiring more men. The adit is in 840 ft. and has intersected a stringer of quartz three feet wide and heavy with chalcopyrite. This is the best copper ore ever found in the Lambert creek section. Concrete foundations have been constructed for a 100-h.p. boiler, a 65-h.p. Russell engine and a 6-drill Leyner compressor, which are expected to

arrive inside of two weeks. A dynamo is being installed for electrically lighting the mine and camp. The adit will shortly be connected with the shaft, when the manager expects to be in a position to ship from 100 to 150 tons of ore per day.——The track of the Belcher Mtn. railway will be cleared of snow immediately, in order to run the train for the delivery of the Winnepeg Co.'s machinery. It is probable that it will soon be required for the haulage of ore to the smelters.——A sleigh-road is being constructed from the Bortle Copper-Gold Co.'s shaft to connect with the main wagon-road down Lambert creek, for the haulage of ore to the bunkers at Lambert siding. The company may ship several hundred tons to the Granby smelter, at Grand Forks, B. C. This ore is an iron sulphide which the superintendent says will assay 2 to 3% copper and a few dollars in gold, with about 35% iron. He also says the developments in the Bortle shaft workings are so satisfactory that the company is formulating extensive plans for deep mining; that in addition to electrically-driven air-drills, a diamond-drill equipment is contemplated, and a small sawmill will be installed on timber land lately acquired by the company.——An ore purchasing and transportation company, capitalized at $200,000, for the haulage of ore in the Belcher Mtn. neighborhood, is reported as being incorporated. Some work was done toward constructing a tram-line around the mountain by parties styling themselves the 'Skyline Tram Association,' and a number of ties were cut; but the work was abandoned, owing to the refusal of right-of-way over some mining ground. The incorporators first mentioned, will take over this tramline.——The Advance Mining Co. owns a group of eight claims, situated in the southeastern part of Ferry county, east of the Sherman range and three miles west of the Columbia river. A quartz vein, with ore assaying $100 per ton in gold, silver, and lead, has been developed by two adits, aggregating 1,400 ft. in length, and a winze which goes down 30 ft. and gives a total depth of 135 ft. on the vein. Work on the property was suspended for want of funds. An assessment of one-half mill per share was levied, and work will be resumed shortly. The company is capitalized at $2,000,000, with shares at a par value of $1 each.

Republic, Mar. 1.

KOOTENAY COUNTY.

(Special Correspondence).—Thomas Golden has purchased a controlling interest in the Northwest Cœur d'Alene Italian Copper company, recently incorporated by a number of Italians who have been developing 10 copper claims in the Priest River country. He has also taken a half interest in a group of five claims from Thomas McCaffery. Under the terms of the purchase the company must run a tunnel 500 feet.

Spokane, Feb. 16.

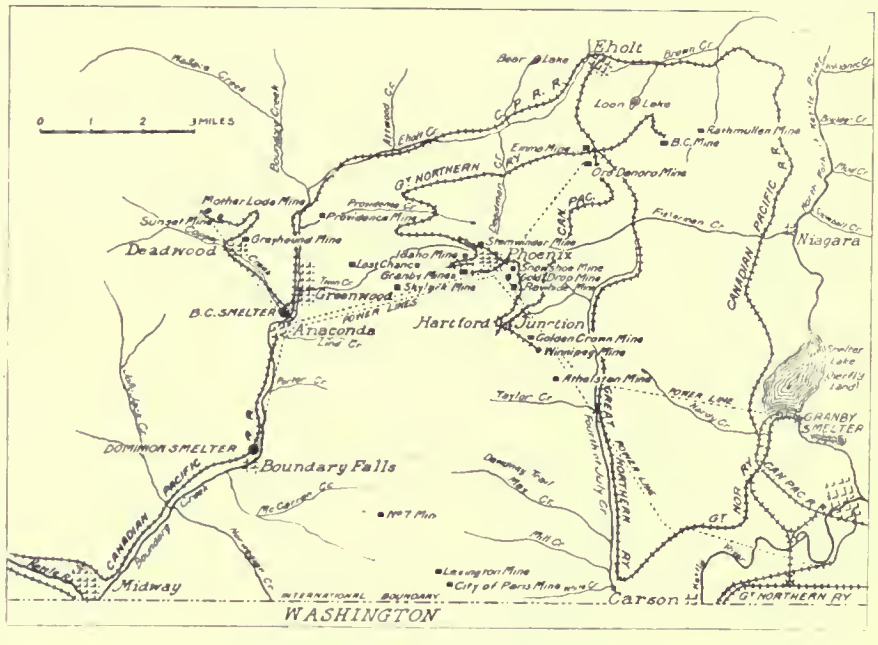
SKAMANIA COUNTY.

(Special Correspondence).—The St. Helens district is in the northwest corner of Skamania, extending into Lewis county. It occupies townships 9, 10, and 11 North, of ranges 5 and 6 East. Tilton, the terminus of the Tacoma & Eastern railroad, is 25 miles north from the district. Castle Rock, on the Northern Pacific, is 50 miles west. The district is situated just north of Mt. St. Helens. The country rock consists of syenite, granite, and diorite, all of which are covered in most cases by volcanic ash, but often the formation has been exposed by erosion. The country is heavily wooded. There are veins along the fault planes and contact veins between syenite and rhyolite. These veins as a rule stand vertically. Their width varies from 4 to 100 ft. The gangue is often mineralized country rock, or it may consist of quartz and quartzite. The ore is chalcopyrite and bornite. Much of it is rich enough for shipment, when railroad transportation is provided. Extensive development has been accomplished by the Cascadia Mining Co. This company will now be able to ship a considerable tonnage of ore. The Sweden and Norway groups are being developed by Dr. Coe, of Portland.

Portland, March 1.

BRITISH COLUMBIA.

The following are the shipments and smelter receipts in southeastern British Columbia districts for the week ending Feb. 23: East of Columbia river, 2,146; Rossland, 4,780; and Boundary, 12,725 tons of ore. The smelter receipts were: Grand Forks, 6,287; Boundary Falls, 2,584; Greenwood, 2,280; Trail, 4,136; Nelson, 399; Northport, 2,835; and Marysville, 600 tons. Total, 19,121 tons for the week.——The Queen Victoria mine, just west of Nelson, recently purchased by James Cronin and associates, shipped its first lot of ore this afternoon to the Trail smelter.——The shipments from the Rossland mines for the same week were: Centre Star, 1,410; Le Roi, 3,150, and Le Roi No. 2, 510. Total, 5,070 tons of ore.——The new conveyor and large rock breaker at the Centre Star have been started. The breaker has a capacity of 1,000 tons per 10 hr., and the conveying plant will carry the ore from the mouth of the shaft to the ore bunkers.——The supply of coal, coke and cars is increasing, and it is expected that but little more trouble will be experienced.——Slocan operators and miners are rejoicing over the news that the duty on zinc has been abolished by the U. S. Government, which means increased activity at all the zinc mines of that district. The Lucky Jim and Slocan Star properties will be big producers of zinc.



The Boundary District of British Columbia.

MEXICO.

GUANAJUATO.

(Special Correspondence).—The Real del Monte y Pachuca Co. of Pachuca will equip both their large cyanide all-slime plants with Butters filters. These cyanide plants are to be increased in size as soon as the first section is started, and any increase of slime is to be treated by the same filter.——Mr. Pattinson is considering the installation of a cyanide plant for El Bote mine near Zacatecas.——A plant is contemplated for treating the low-grade ores (under $40) of the Valenciana mine near Cañitas, Zacatecas.——The grading for the extension of the railroad from Marfil to Guanajuato is almost finished, and the laying of rails will begin soon. The proposed belt-line railroad to reach all the mines of the district will soon be begun and will, when completed, largely decrease mining and milling costs in the camp.——A large mill and cyanide plant is to be built at La Luz mine, about 9 km. from Guanajuato.

Guanajuato, Feb. 23.

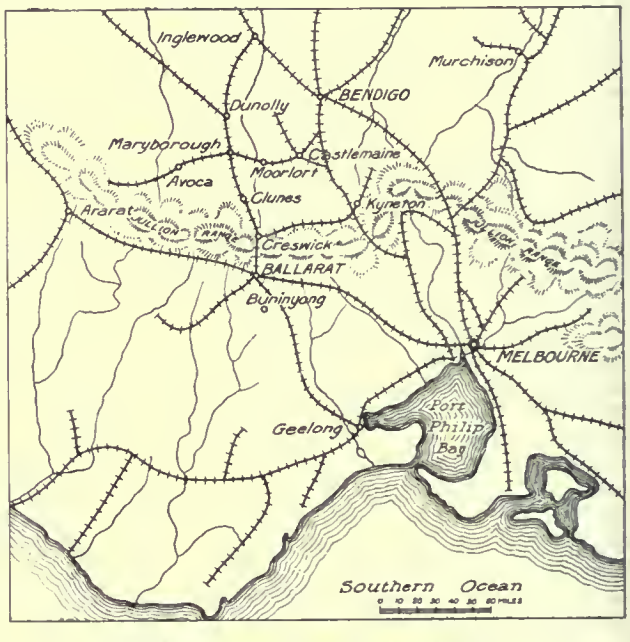
Special Correspondence.

London.

An Interesting Question.—Results at Dolcoath.—A New Shaft.—Cornish Enterprise in the Straits.—Gold Output of New Zealand.—The Deep Leads.—Depreciation in Rand Stocks.—Penn-Wyoming Co.—Good News From El Oro.

In the absence of a more thrilling topic, "One mine, one manager" is a proposal which has been agitating the public mind in Cornwall for some weeks past. The question is raised periodically, this time in consequence of the directors of Grenville United and Great Condurrow mines advertising for a manager for each of these companies, in the place of Mr. James Negus, who has been superintending both properties. From one point of view the mining industry in the County generally should, within the limits of a man's time and opportunity, benefit by such experience and ability as for example may be attained by a manager like, let us say, Mr. Arthur Thomas of Dolcoath. It is a proverb in Cornwall that "a good bal makes a good captain." In the case cited there must be some truth in the old saying, as the mine in question has afforded a sphere of activity greatly calculated to evolve what we know as a first-class expert in tin mining. That being so, it seems only fair that the stockholders in the particular mine should have a prescriptive right to the special services of the man in whose making their property has played a predominant part. Although this point of view may be readily conceded, it is argued by those who have at heart the prosperity of the County as a whole that a manager of recognized standing should not be the exclusive monopoly of a particular mine. In this relation it is pointed out that in Africa and America one expert is placed at the head of a series of mines—Mr. Harry T. Johns on the Rand, for instance. Equally it is held that men like the manager of Dolcoath and Mr. William Thomas of Botallack should not be confined to single propositions. It would not be to the interests of the industry to restrict their activities in such a way. For the present it would seem that Grenville United Co. has adopted the "one mine, one manager" principle, as the directors have appointed Mr. Frank Williams (assistant manager of West Kitty, St. Agnes) exclusively as their manager in the place of Mr. James Negus, who held other appointments as well. Mr. Williams, who is the son of the manager of West Kitty, had, it is said, a brilliant career at the Redruth School of Mines, and is quite a young man. Another new appointment is that of Capt. B. Nicholas as manager of Parbola, Gwinear. Capt. Nicholas is spoken of as having gained his early mining experience in the Levant mine, and secured brilliant success in science examinations, geology and kindred subjects being his favorite studies. For some years he held a responsible position on the Rand, and afterwards went to Brazil and Italy. Three years ago he was appointed agent at Dolcoath mine, on the retirement of Capt. Tamblyn, and has devoted most of his time to the working of the western part of the mine.

At Dolcoath, the bottom of the mine has grown so rich that the sinking of Williams' shaft is to be resumed as soon as the directors can arrange terms with the new 'lords'; and when the new shaft is down, a more rapid and economical method of working will be adopted. The new shaft will strike the lode 500 fathoms deep. A net profit of £41,757 was made by the mine in the second half of last year, which compares with £40,166 in the first half and £22,386 in the corresponding period of 1905. The dividend, at the rate of 20% per annum, compares with 15% for the preceding half and 7½% for the corresponding period, and the total for the year is 17½% against 6¼% in 1905. The rise in the price of tin more than counterbalanced the decline in the quality of the ore raised. The question of workmen's dwellings is said to be seriously engaging the attention of the executives of Botallack. It is proposed to erect a colony of workmen's cottages and let them to the miners at a reasonable rent. A new shaft is to be sunk immediately. It will take three years. Meanwhile three old shafts are being cut down and timbered, and as soon as the engines are working, the mine is expected to make returns. It is hoped to start the Great Condurrow pumping engine during the present month. According to the *Western Morning News*, the outlook in the Breage district is rapidly improving. Old miners describe Godolphin and Tregoning hills in Breage, as "houses of tin." After prospecting there for several weeks a party of miners has discovered a lode in the old Wheal Lemon



Map of Part of Victoria, Australia.

sett, and in all probability operations will be conducted there on more extended lines in the near future. Old Great Work mine has been acquired from the licensees (South West Cornwall Mines Ltd.) by a party of London capitalists. It is proposed to install an electrical plant and machinery on a large scale, and the property is to be thoroughly developed. Electricity, it is stated, will be generated at old Great Work for working the machinery and appliances on order for the adjoining mines, Lady Gwendoline and Wheal Reath, where the South-West Cornwall Mines have been operating for several months. Old Great Work is regarded as one of the best tin mines in the West, and it has a fine history. It is an extensive sett, and was first opened over 200 years ago. There are a large number of shafts, the principal ones being Great Fortune, 170 fathoms; Deer Park, 200; and Leeds, 166. The known tin lodes number about 13. The mother lode proceeds east and west, dips north one foot to the fathom, averages five feet in width, and gave a high percentage of tin to the ton. Wolfram exists in large quantities in some parts.

It is reported that a new Straits company, Tekka (Ltd.), is being formed under Cornish auspices, James Wickett, J. H. Bain, A. Lanyon, G. B. Pearce, and F. D. Osborne being directors. The company will acquire a property in the Kinta district of Perak, in the Federated Malay States, and work it on similar lines to those which have been so successful on the Gopeng prop-

erties. The capital of the new company will be £90,000 in 90,000 shares, and it is proposed to issue 70,000. The price to be paid is £30,000, leaving £40,000 for working capital, and of the present issue of 55,000 shares Messrs. Osborne and Chappell, who are the vendors, and the managers of the most successful of the Straits mines, have agreed to apply for 40,000 on behalf of themselves and their friends. All the shares have been applied for, the capital being, in fact, over-subscribed.

New Zealand statistics for the year 1906 show that the gold returns from the Colony are higher during the period under review than for the past 35 years. Since the industry was started on a sound basis in the year 1857 there have been prodnced no fewer than 17,708,978 oz. valued at £69,567,802. In 1906 the yield amounted to 562,351 oz. bullion to the value of £2,337,218, an improvement over 1905 of 41,839 oz. or £243,133. The list of dividend paying mines on the London market is a small one, headed by the Waihi, the distribution to stockholders in 1906 having reached a total of 70% on an issued capital of nearly half a million sterling.

The usual pumping statistics are fortheoming from Loddon Valley (deep leads) for December. The main pumping plant ran 30 days 19¾ hours during the month and raised 99,113,440 gal., consuming 1,000 tons of firewood. The Keystone plant ran nearly full time and pumped 58,678,704 gal. for the month, the consumption of firewood being 615 tons. Regarding the developments, later news by cable is to the effect that the wash has been entered in the cross-cut west of the No. 3 rise from south drift No. 3. A section 4½ ft. by 2 ft. by 6 in. was sampled and gave 3 dwt. 3 gr., which is described as a splendid sample and highly payable. The stock moved up on this announcement.

Notwithstanding the record for dividends created by Rand mining companies in 1906 (the total having been £5,565,970), the leading London companies investing in the stock of these mines continue the writing down process in consequence of deprecintion in prices during the year. The South African Gold Trust Co. has deducted no less a sum than £364,456 from the value of Transvaal stock, followed by the Exploration Co. with £98,726. It seems a paradox that, while the mining companies' dividends increase, the profits of the investing companies should decrease, but it is only sound policy to make good the loss of capital in the manner described.

A circular has been issued by Penn-Wyoming Copper, which reports that the company will shortly be in a position to put into operation the re-modeled smelter and new concentrating plant, which will treat the quantity of copper ore accumulated from the company's operations during the past year, as well as the ore coming from other mines throughout the Encampment district. The new mill is completed, with the exception of some lighter machinery, belting, and shafting. The heavy machinery, which includes boilers, crushers, rolls, and mills, is installed. The balance of the machinery and other material to finish it is either in the cars at Wolcott Junction or in the course of being hauled between Wolcott and Encampment. The Westinghouse turbine engine has arrived at Wolcott. This will give the company a minimum of 1,250 h.p. at their smelting works. Dealing with inquiries from stockholders as to the earning power of the company, and what dividend will be paid when smelting operations are resumed, the company states: The net profit on the last 90 days during which the old mill was running 12 months ago was $175,786. At the present price of copper this would have been a net profit of $392,054 on a 90 days run only. The smelting and reduction works as re-modeled and rebuilt can handle three times as much ore as the old works, and, when in full operation, there will be a saving of from $500 to $800 per day on rail transportation; in addition to which, as the company will own the railroad itself, the profits derived from transportation will go to the company's treasury.

Stockholders in El Oro (Mexico) are pleased with the latest news. In a general summary of the development work for the past six months, Mr. Raymond, the general manager, reports: "1,000-ft. level—the drift south on the branch veins, first encountered in the cross-cut from the shaft on the hanging-wall side of the San Rafael vein, has been advanced a distance of 125 ft. Within this drift two veins have now been found, each varying from 6 to 15 in. in width, and have been exposed for the entire length. They present a very favorable appearance, and have shown an average value of $11 per ton, this value increasing at times to $20 and $40 per ton whenever these two veins come together. Going north from the shaft, we have encountered, at a distance of 230 ft., what appears like the commencement of an orebody, which at present shows a width of about 6 ft., sampling from $3.50 to $5 in gold." In a cable dated February 7, Mr. Raymond states: "North drift on the main San Rafael vein in the 1,000-ft. level shows considerable improvement, and for the first time exposes sulphide ore; samples from the face yield from $3 to $10 per ton." Mr. Raymond's report also states that in the middle and southern sections the orebodies already exposed have been shown to be of greater length, and have been proved to a further depth than stated in the last annual report.

Johannesburg, Transvaal.

Stoping by Hand.—A New Drill for Narrow Stopes.—Political Events.—Unemployed Labor.—Gold Mining Details.

In those mines of the Rand where the reefs are narrow, from one to six inches wide, narrow stoping is of the utmost importance. It is almost impossible to carry the stopes from 24 to 30 in. with the rock-drills supplied by the standard makers, so that hand-labor becomes necessary. Working such narrow reefs with hand-labor requires a large number of hammers to keep a mill supplied with ore. In a narrow stope one coolie or Kaffir will break about 0.5 to 0.6 ton per shift. Of this about 20% is sorted out as waste, leaving abont 0.44 ton per man per shift for the mill. As long as hand-labor is depended on to keep the mines going, the demand for Kaffir or coolie labor will be excessive. On accounnt of the agitation against Chinese and the scarcity of Kaffir labor, much attention has been given to the perfecting of the Gordon drill, a machine designed for narrow stoping, from 24 to 30 inches. Some interesting tests have been made on the Robinson mine, and it was found that one white miner superintending four drills broke as much rock in a stope as 25 hammer-Kaffirs broke. The white man was assisted by five Kaffirs.

On a small scale this drill has proved so successful that two of the leading mining houses have ordered several hundred of these machines. Politicians have made a great deal out of this fact, and declare that the Gordon drill will do away with so many hammer-hands that it will be unnecessary to employ Chinese at all. It is too soon to state what effect this drill will have on the economic situation. Should it solve the labor question, and do away with the necessity of Chinese labor, South Africa will owe it a debt of gratitude. It is improbable that the stoping costs will be less by this drill than by hand-labor. A considerable improvement in the working conditions will be brought about, for by the use of water in drilling no dust is formed when using the Gordon

drill. A company has been floated called Gordon Drill Ltd., and it is stated that the machines will be made by the Ingersoll Rand Company.

Quite a blow to the prospects of the Progressive party was given last week by the action of Sir Richard Solomon in throwing in his lot with the Nationalist party, which is working with Het Volk, the Boer party. It is stated that Sir Richard will probably be the first premier of the Transvaal, and that, if he succeeds, the Het Volk party will have a majority in the first parliament. This party is not sympathetic to the mining industry. They seem to think that the mines can stand any amount of taxation, both direct and indirect, and that somehow or other, the mines can be run without so much unskilled labor. None of the Het Volk party are practical mining men, and consequently know little about our problems. In the future the mining industry must have the most sympathetic legislation, and every help. The 'deep-deep' level mines will have all they can do to pay dividends, without being hampered with unjust taxation.

The mining correspondent of the *Rand Daily Mail*, in a recent letter from Australia, stated there were a number of openings for men on the Broken Hill Proprietary, and advised men out of work in Johannesburg to make for Australia. This letter created a lot of discussion, but it is improbable that many of the unemployed will leave the Rand. The efficient men are hanging on, realizing that there will be a big improvement here, if the political campaign ends the right way. The inefficient unemployed would just as soon starve on the Rand as anywhere else.

A table published a day or so ago shows that the average value per ton milled in December was 33.85 shillings. The highest yield per ton milled on the Rand was 63.83 on the Bonanza, and the two lowest mines were the Orion with 19.9s., and the Glencairn Main Reef with 22.36s. per ton. During December the average amount of waste rock sorted out was 15.84 per cent.

Butte, Montana.

The February Output.—Production Hindered.—The Labor Situation.—Serious Condition.—Preparations for a Strike.—Discovery in the Berlin.—The Butte & Continental.—New Incorporations.

The mines of Butte yielded 258,300 tons of ore in February, and from that 19,682,460 lb. copper were produced. The shortage of coal and cars, and the extreme cold weather during the fore part of the month, were responsible for the small production. The production of the different companies was as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	66,500	5,120,500
Anaconda	72,800	5,460,000
Butte & Boston	11,200	761,600
Washoe	10,500	721,500
Parrot	6,160	369,600
Trenton	11,900	725,900
North Butte	25,200	2,646,000
Coalition	22,960	1,722,000
Original	15,960	973,560
East Butte	2,800	221,000
Pittsburgh & Montana	4,480	380,800
La France	5,040	378,000
Miscellaneous	2,800	196,000
Total	258,300	19,682,460

The unsettled labor situation in Butte has had a bad effect on mining conditions lately, but there is no probability of any serious trouble between the miners and the mining companies. Although the miners voted to raise wages from $3.75 to $4 per day, there is a unanimous feeling among them that there will be no strike even if the companies will not grant the increase asked for. The miners say their vote for a raise was merely a request, and that they were forced into the action by the constantly renewed demands for more wages by the smaller labor unions, whose demands have always been granted and the money paid them has added to the increased cost of living in Butte, from which the miners, being the largest portion of the population, have suffered most. House rent and all necessaries of life have been advanced 30 to 50% in Butte in two or three years, all due to the fact that landlords, merchants, and dealers of all classes have gradually advanced their prices to meet the demands of labor. Before the miners voted on the increase, they were informed that it would not be granted. The mining companies, while believing there will be no strike on the first of May, the time set for the new wage scale to take effect, are taking no chances, and they have suspended all construction and development work at the mines and smelters, and fully 3,000 men engaged in that class of work have been paid off and discharged. All the mines are being put in condition for a long shut-down, should one become necessary, but until a suspension is forced the mining companies will continue the extraction of ore from the ground blocked out. The development work in all of the large mines is from two to three years in advance of actual mining and in some of the properties of the Amalgamated, North Butte, and Butte Coalition there are ore reserves blocked out upon which mining can be done for five years or more. There will, therefore, be no diminution of the output unless a complete shut-down should be forced upon the operators. All shaft-sinking on the Badger State, Greenleaf, Minnie Healey, Corra, Pennsylvania, Anaconda, High Ore, Parrot, Gagnon, Little Mina, Berlin, and all other development work in the Amalgamated mines has been stopped. So has the work of enlarging the smelters at Great Falls and Anaconda. All of the large mining companies have entered an agreement not to pay the increased wages demanded. The opposition is not so much to the miners as it is against the whole tendency of labor in Butte. The city and the district have always been dominated by labor unions, and employers believe the situation has reached a stage of intolerance that must be met by united action, and so, although they sympathize with the miners, the merchants and mining interests have united in a protest which is likely to clear the labor atmosphere of Butte before a final adjustment of the wage question is reached. The miners, whose regular scale for underground work is $3,50, although the mining companies have voluntarily paid $3.75, are comparatively the poorest paid class of labor in Butte. Hod-carriers get $5.50 per day and common street laborers $3, while plumbers get $7 and have in force a rule that no other plumbers can come to Butte, no one may learn the trade in Butte, and no one can employ a plumber except through a master plumber, who charges the builder or employer $12 per day for the plumber's services. Printers get $6 per day for setting 30,000 ems, and when the pressmen demanded similar wages for their two or three hours of labor the newspapers balked and the four dailies suspended publication. For three weeks Butte and Anaconda, with a combined population of 90,000, have been without newspapers. The labor situation in Butte must be reconstructed before the mines will resume full operation again, and before the newspapers will issue another edition. National labor organizers, who have been sent to Butte to investigate the situation, have expressed astonishment at the tolerance of conditions by employers. They say a general labor strike in Butte is not possible, as the strikers would have little sympathy from the outside.

The labor troubles have no bearing or effect on the new companies that are engaged in developing numerous properties in all parts of the district, because, in order to

get the best and most competent miners, these concerns have always paid more than the regulation scale of wages. The development work of such companies as the East Butte, Butte & London, Butte Exploration, Amazon-Butte, Ida Montana, Butte Copper, Butte-Milwaukee, Butte & Superior, Farrell, Alliance, La France, Davis-Daly, Butte Central & Boston, Butte & Bacorn, Butte & Summit Valley, Bullwhacker, Pittsburg & Montana, and Reins Copper companies will not be interrupted or interfered with. Good reports of progress and encouraging development comes from nearly all of the new properties.

The strike recently made in the Berlin claim by the North Butte Co. is one of the most important ever made in the district. Driving on the vein proves that the orebody continues in extent and richness. The vein is from 28 to 30 ft. wide, all of high-grade ore, and has six to seven feet of copper glance that assays 50% copper. The vein runs northwest and southeast, and will probably be found in the ground of the Butte & London Co. and other properties east of the Berlin.——The Butte Copper Exploration Co., which is developing the Six O'Clock group of mines east of the Butte & London, has penetrated a

Montana.

vein in the cross-cut north from the 1,000-ft. level. The cross-cut passed through a large fault and then entered a vein. No big body of ore has been found, but driving is being done on a small seam of ore and the indications are taken to be encouraging. It may be necessary to sink a few hundred feet deeper, but the officials in Butte and the miners employed in the cross-cut believe ore will be found at the present depth.

Good progress is being made in the work on the Ophir mine by the Butte Central & Boston Copper corporation. The shaft will be enlarged from the 500-ft. level to the surface and the work will take probably three months. Meantime no stoping will be done, but development work will be pushed. Some fine orebodies have been opened.——The Butte & Continental Mining Co. has ordered a lot of new machinery for a complete and modern surface plant, which will be installed on its claims east of the Butte district, on top of the continental divide. Two of the claims are developed, and Mr. Tomek, the manager, says the mines can be made to pay for all development work in a few months after work is resumed.——The Michigan Mining Co., with a capital stock of $1,000,000, has been incorporated in Butte. The directors are J. H. Vivian, James H. Rowe, James Higgins, James E. Higgins, and J. E. Corette. —— The Pittsburgh Gold & Tungsten Mining Co., which is developing some gold and tungsten deposits near Gardiner, Mont., has increased its capital stock from $100,000 to $1,000,000, and has moved its principal office from Gardiner to Butte. The directors are Harry Bush and B. F. Shearer, of Pittsburg, and E. A. Downs, of Livingston, Montana.

Denver, Colorado.

Resumption of Work in Old Mines.—Varied Resourcefulness of Colorado Mining Districts.—The Legislature and Its Foolishness.—A Tunneling Machine.

The re-opening of the old workings of the Millington mine near Georgetown stimulates a moment's reflection on the permanence of the various mining districts of Colorado. It is natural to think of mining as a temporary industry; ore deposits, after being worked for a longer or shorter period, become so exhausted or impoverished in value as to be no longer profitable, and are abandoned. But in many cases the operations may extend over a long period of time, as certain Spanish mines whose honorable history covers more than one century. Districts are even less temporary in their nature, for the stimulus of the propinquity of producing mines makes possible exploration that frequently opens up larger deposits than those originally discovered, which, with the cheaper freight, lower working and treatment costs that result from the bigger scale of working, and better knowledge of the peculiar problems of the districts, stretch out a span of life so that it extends in uninterrupted security long after the original 'boom' has become little more than a memory. Such, for example, is Leadville, which for forty years has steadily persisted, changing completely in the meanwhile its character as a mining district, so that minerals once regarded as decidedly detrimental are now a source of profit, and which at the end of its quadrennial period seems to have an assured future for many years to come. In like degree the same is true of the other mining districts of the State. Cripple Creek, after touching the crest of its wave of prosperity, apparently has settled down to a steady production. Not to stretch out the list too far, we may sum up by saying that the mineral industry of Colorado is not fated to disappear, but to renew itself periodically, changing its form, but maintaining its volume.

The action of the lower House of the present legislature of Colorado, now sitting at Denver, in adjourning for a greater period of time than the Constitution permits, seems extremely likely to affect the validity of the laws passed during this session. Whether the laws passed may be actually unconstitutional or not, opportunity will be afforded for tiresome and expensive legal battles, which, in the end, are likely to result in depleting the public purse, while those whom the law seeks to restrain continue the even tenor of their way. Undoubtedly this will be true of the corporation publicity law, should it finally secure passage. It was to be expected that those affected by it would make every effort to escape complying with its provisions, but the action of the legislature is well calculated to make such escape easy. The patience of the public with the men it designates to frame its laws is truly remarkable.

The owners of the rights of the Karns tunnel-driving machine are making efforts to have it adopted to drive the new drainage adit at Cripple Creek. The claim is made that with it the adit can be driven in one-third the time and at one-half the cost of the same work when done with rock-drills. The machine is somewhat similar to types that have previously been tried in tunnel work, consisting of a wheel of the requisite diameter, carrying revolving discs. Whether it will be given a trial remains to be seen. The inadvisability of further complicating the unforeseen in engineering work by using new and improved types of machinery usually appeals so

strongly to the engineer in charge of important works that he is likely to turn a deaf ear to the enthusiastic predictions of inventors. Ostwald has said that the possession of accurate scientific knowledge serves to turn its possessor into a true prophet, who can correctly prophesy future happenings. But, unfortunately, at best our stock of knowledge is painfully limited, and the clear-headed and conscientious engineer generally prefers to limit his prophesying to its least possible dimensions.

Salt Lake, Utah.

The Cactus to Pay a Dividend.—Consolidation at Stockton.—Shipments from Tintic.—Output of Park City.—The Ontario Adit.

The Newhouse Mines & Smelters Co., owner of the Cactus mine in Beaver county, will pay dividends before the close of the present year. This announcement has been made by Samuel Newhouse, president of the corporation. On the 600-ft. level of the mine the ore-body has been opened to a width of 246 ft. While the ore is largely a milling product, there are extensive deposits of high-grade ore. Shipments of the latter, averaging better than 15% copper, are being made. It is estimated that the March earnings will net about $225,000.——The Frisco Contact mine, in Beaver county, is still inactive. The management complains that it has been impossible to get fuel.——Samuel Newhouse, D. C. Jackling, and Charles W. Whitley have purchased a large stock interest in the Emma Copper Co., with properties at Alta. The Alta Coalition Copper Co. has been formed to develop a property near Alta. The officers are: F. R. Snow, president; B. F. Grant, vice-president, and N. Y. Stringham, of Salt Lake, treasurer. It is expected that the contract for the proposed mill for the Albion mine at Alta will be let about April 1.

It has been learned from an authoritative source that F. Augustus Heinze has secured options on several mines in Stockton and that he is effecting a consolidation scheme. It is believed that the Honerine mine and drainage adit is included in the list. Although nothing official can be obtained at this time, it is fairly certain that the Bingham Con. Mining & Smelting Co., will move its Bingham Junction smelter to Tooele county, and it is just possible that the new plant will be erected somewhere near the mouth of the Honerine adit, from which an abundant water supply could be obtained, in addition to its convenience as an avenue through which the ores of nearly all the principal mines of the district will come. The management of the New Stockton Mining Co. is figuring on the installation of an aerial tramway and the construction of a new mill. The property is equipped with a small plant, but not of the size sufficient to much more than meet operating expenses.

The ore shipments from the Tintic mining district last week amounted to 151 carloads, the shipping properties and respective amounts being: Ajax, 1; Brooklyn, 2; Bullion Beck, 9; Beck Tunnel, 8; Carisa, 2; Centennial Eureka, 57; Eureka Hill, 12; Eagle & Blue Bell, 6; Swansea, 4; Tintic Iron, 6; Uncle Sam, 1; Victoria, 6; Yankee Con., 2 carloads.——The Lower Mammoth Mining Co. has its two new electric hoists in service and is marketing ore at the rate of 100 tons per day.——Shareholders of the Bullock Mining Co., operating in the Tintic district and with offices at Provo, has elected the following officers: B. H. Bullock, president; J. I. Bullock, vice-president; who, with M. M. Kellog, W. F. Giles, and Thomas Boardman are directors.

The ore shipments from Park City last week aggregated about 1,650 tons, the same coming from the following properties: Daly-Judge, 774; Little Bell, 11; Daly, 77; Silver King, 605; Daly-West, 510; Ontario, 98 tons. The development of the Naildriver property continues vigorously. Work at the present time is being directed on the 200-ft. cross-cut from the 850-ft. level. The Ontario drainage adit is cleared as far as No. 2 Ontario shaft. The latter is being repaired and put in condition for operation. The adit has been closed for over two years on account of caves.

Cripple Creek, Colorado.

El Paso Surrenders Drilling Equipment to Tunnel Co.—Drainage Adit to be Pushed.—Another Cyanide Mill.—British-American Co.—The Christmas Lease.

A 12-drill Norwalk compressor and a 175-h.p. electric motor ordered some months back for the El Paso mine are to be turned over, when received, to the Drainage Tunnel Co. for operating the drills on the big bore. By accepting this offer of the El Paso Co. work can be commenced several months sooner than would otherwise be the case. The cost of the machinery, which should arrive in the district within the next few days, will be borne by the tunnel company. Grading has already commenced for the various buildings that will be required at the portal of the adit. A first request for 10% of the amount subscribed by the various mining companies has been made and has resulted so far in the receipt of $22,000.

Grading has commeneed for the new cyanide mill on the W. P. H. property situated on Ironclad hill. A. B. Whitmore is manager of the leasing company that is operating the W. P. H. mine. The plant is being erected under the direction of Engineer Groch and should be ready for operations by May 1.——It is stated that the large cyanide mill of the Cripple Creek Homestake Mining & Reduction Co. will be put in operation next week at a daily capacity of not less than 100 tons. The Phœnix Mining & Leasing Co., composed principally of the Homestake Co.'s directorate, will operate the plant, this decision being brought about by their successful treatment of ore averaging $4 or $5 per ton in the small Homestake mill. The ore will be obtained principally from the Ironclad and Magna Charta claims adjoining the mill.

The British-American Mining Co., Ltd., that is, Becker, Travell & Co., operating the South Dante, shipped on an average a car of ore per day during the month of February. The bulk ore has been running in the neighborhood of $20, and the screening $30 per ton, but much better returns are expected during the present month, as some high-grade ore has been encountered during the last few days, which should make the screening run several ounces in gold. Samples from this new strike show rusty gold in several places, and assay many hundred dollars per ton.——The Christmas mine, situated between the Golden Cycle and the Vindicator mines on Bull hill, shipped 500 tons of ore during the month of February, averaging $25 per ton. The ore is being mined on the seventh, eighth, ninth, and tenth levels. Becker, Travell & Co. are operating this property under lease, which is now looking better than it has for several months.

McLeod, Lewis & Jones, lessees on the Proper claim of the Stratton Estate, shipped a car of ore last week, which gave returns of $50 per ton. A car of ore per week is being shipped from this lease, the ore being obtained at a depth of 100 feet.

The milling of low-grade ores is becoming such an important problem in this camp, that much experimental work is being done by the local custom-mills. Efforts have been confined almost exclusively to development of the cyanide process in a form which will render roasting unnecessary, but it is still a grave question whether the low-grade sulphide ores can ever be treated successfully by this process.

Cobalt, Ontario.

Growth of Business.— Extension of the District.— Working Under the Lake.— Systematic Prospecting.— The Green-Meehan.— Some Rich Ore.— Right-of-Way Co.— New Camp in Northern Ontario. Larder Lake.—Another Gold Find by Prospectors.

The towns of Cobalt, Latchford, and Haileybury are the chief distributing points for the mail-matter coming into this mining camp. The growing importance of the camp, and the volume of buiness done within its borders, may be fairly evidenced by the postal returns of these three postoffices. At Cobalt, 2,000 letters are received daily, and the revenue of this little office amounts to $15,000 or $18,000 per year. On Christmas Day, 22 bags of mail-matter were assorted, and it took the postmaster and five assistants nearly five hours of steady work to accomplish this.

New discoveries are reported from all quarters, and the mining area has been enlarged for a distance of from 25 to 50 miles in all directions from the town of Cobalt. While in these extensions the surface values may not prove to be so high as in the small six miles square of the camp proper, they are not wanting men who declare that it will be in some of the extensions that mining will be carried on, say, 25 years hence. Charles Giffard at the Victoria struck native silver the other day in his main shaft at a depth of 35 ft. The surface ore ran very low in silver. His property is in the fifth concession of Coleman and adjoins the Colonial.—— At the Cobalt Chief and the Dufferin, fair discoveries were made last week. Supt. Fee, of the Cobalt Chief, has installed one of the best plants in the Portage Bay district, and has found small flakes of silver in the shaft being sunk on the main vein, which on the surface was a small streak a couple of inches wide.——Supt. Shillington of the Dufferin, is installing a plant from the Rand-Jenkes Company.

The mining rights of Cobalt lake were recently sold by the Ontario Government for over one million dollars. Many mining men in the camp looked unfavorably on this proposition in its early history, but during the past two weeks some valuable finds have been made on the 33-ft. shore-line, which the company owns, along with the right to mine beneath the lake. One of these is a 14-in. vein that was located on February 20, a mass of niccolite and cobalt undoubtedly carrying silver values, was uncovered.

Vein No. 4, on the Lake property, has an average width of 12 in., it is a calcite vein with surface assays as high as 9,875 oz. silver per ton. It is on this vein that the main shaft is being sunk. Another vein known as No. 5 had a surface width of six inches, and carrys 1,000 oz. silver per ton. A first-class plant has been ordered from the Rand-Jenkes Co., consisting of two 100 h.p. boilers, one 15-drill compressor, steam-hoists, etc. The Lake is being surveyed in blocks, one chain square, and pegs are being driven in the ice at the four corners of each block. The diamond-drill is being used to test the depth to bedrock at each corner of these blocks or squares. A chart will be made and the different depths of each test recorded so that the management will be enabled to estimate the different depths to be attained in the different shafts that are being sunk, so as to ensure them against any trouble that might be caused by water leaking through to their cross-cuts beneath the Lake.

A large office has been erected on the shore lying opposite the town of Cobalt, and a sleeping camp to accommodate 85 men will be built immediately. At present a gang of 65 men is kept constantly at work stripping the 33-ft. shore-line and sinking five shafts.

At the Red Rock, Green-Meehan, and Hunter properties active developments are taking place, and at the two former, first-class plants have been ordered and are partially installed. At the Green-Meehan two 100-h.p. boilers are on the ground, the power-house is nearly completed, and accommodation will be forthcoming for 120 men within the next two weeks. This mine is not capitalized at $2,500,000 in one dollar shares as has erroneously been stated in some papers. The holding company has that capitalization, but the Green-Meehan mine was capitalized at $1,500,000. The stock has sold as high as $1.70. The present company took hold of the property in November, and has shipped two carloads of rich ore, and today has a third carload of 40 tons ready for shipment. On vein No. 1 a double-compartment shaft has been sunk 35 ft., and to this level the vein has maintained its surface width of six inches; the width of course varies in some places, narrowing to three inches. At the 35-ft. level a distinct and separate vein has been found in the shaft, the calcite carrying native silver. The work on No. 2 vein has been entirely an open-cut 80 ft. long and 25 ft. wide, and at the bottom of the cut the vein is 11 in. wide, carries over 1,000 oz. silver per ton, and is of solid metallic ore. The Keewatin wall-rock is heavily shot with leaf silver on either side for a distance of four or five feet, and this country-rock will run probably 400 oz. silver per ton, and will be treated by a concentrating plant not yet erected. There will be sufficient of this ore to keep such a plant constantly at work.

The sensational first shipment of the Right-of-Way Mining Co. netted $57,000, which has enabled this company to declare a dividend of 7% within three months of acquiring the property. The ore has simply been gouged out of their vein, which runs along the railway track, and has come from a hole a few feet long and a few feet deep.

Cobalt will have many rival camps this summer; they will be spread out all over northern New Ontario. A Larder boom has already started. This Larder gold camp as yet is only a possibility, and has been turned down by several mining engineers, but so was Cobalt in its early history. Although nearly 400 miles north of Toronto, hundreds of men are going in on snowshoes and dog-trains every week. On the northwest shore of this small lake a town of 1,100 inhabitants has sprung into existence. People are living in wagons, under wagons, and in tents, and a repetition of the Klondike boom is being experienced. There are three trails from different points along the T. & N. O. Railway into Larder. The shortest one is from Boston, and is only nine miles long, but it is said that owing to the bad hills there are more broken toboggans decorating the trees along the trail than are to be found on the other two. Englehart, a divisional point on the railway, 37 miles north of Cobalt, is recognized as the best starting point for Larder, and with a team and sleigh a return trip can be made from there in a day.

Some prospectors returning from a much more distant point, either in this Province or the neighboring Province of Quebec, have brought some magnificent gold samples. The exact location of this new find has not been made public, but there is no doubt the specimens come from above the height-of-land. The old prospector in charge of the party states that gold, silver, and copper-bearing quartz has been found in large veins, and that good gold and copper values are found in every foot of the shafts so far sunk, some of which are down to a depth of over fifty feet. Forty miles north of Larder, up the Montreal river, discoveries are also being announced, but as similar announcements were made at various times last summer, more definite information will have to be received before it will detract from the attractiveness of Cobalt itself.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE most common cause of earthquakes is either the formation of a great fissure, or else the re-adjustment of the walls of such a fissure.

THE Grand Cañon of the Colorado is 300 miles long and varies from 3,000 to 6,200 ft. in depth, forming the grandest natural geological section known.

THE term 'drift,' as used in geology, is a relic of an early and erroneous idea that the mantle of rock-rubbish which covers glaciated territory was due to overwhelming floods of water from the North.

THE hydrographic basin of the Mississippi river is bounded on the east and west by the Alleghany and the Rocky Mountains, and on the north by a low ridge running westerly from Lake Superior.

CLOTH SCREENS give a greater percentage of opening, and therefore a greater capacity, than punched plate. The percentage of opening is the ratio of the net area of the holes to the whole area of the screening surface.

THE TERM 'denudation' is used by geologists to express the general erosion which the earth-surface has suffered in geological times. The correlative of denudation is 'sedimentation,' and the amount of denudation is measured by the amount of stratified rocks.

IN choosing crushing machines, the points to be considered are first cost, weight, number of wearing parts, power, speed, and wear. At the same time the machine should be simple in construction, easy to erect and operate, and the wearing parts should be easily renewable.

THE deepest bore-hole in the world was bored in Silesia several years ago, to 6,700 ft. In the Transvaal John Schanke, an American contractor, put a hole down 6,340 ft. to cut the Main Reef; the core was two inches at the start and 1⅝ in. diam. at the bottom. A Sullivan Class P. machine was used.

THE Newhouse tunnel, at Idaho Springs, 37 miles west of Denver, and in the lower Clear Creek mining district, was driven a maximum distance of 267 ft. in one month. A total distance of 2,760 ft. was made from September 1899 to August 1900, at a total cost of $79,470, an average of $28 per foot.

A GOOD mixture for concrete is one part of cement, three parts sand, and five parts of crushed rock. The sand should be angular, and the grains irregular in shape, and the stone should be broken fragments and not smooth pebbles. Other proportions often used are: One, two, and four; and one, four, and seven parts.

THE transporting power of a current of water, or the weight of the largest fragment it can carry, varies as the sixth power of the velocity. That is, if a current of certain velocity will move a cubic inch of stone, when the velocity of the current is doubled, it will move a stone sixty-four times as large, and if the velocity were increased ten times, the transporting power would be increased 1,000,000 times.

A TYPICAL 'ESKER' is a long, sinuous ridge of coarse sand or gravel, sharp-crested, with steep slopes, and rarely over 50 ft. in height. It was deposited in the bed of an overloaded glacial stream, which flowed between the ice-walls, either in a tunnel beneath the ice, or more probably in a trench or cañon cut down from the surface of the glacier by bottom melting. 'Esker' is a term commonly used among geologists in Michigan.

LOESS, in the form of a brownish, soft, structureless earth, covers great areas of the Mississippi basin. These deposits are considered, in part at least, as wind-born dust. Some authorities maintain that the material may have been glacial in its origin, but that it may have been subsequently transported and deposited by eolian agencies. Of course, eolian deposits must contain no rock materials that wind is incompetent to carry.

THE method used at Tombstone for mining old stope-filling consists in driving a series of spiling-drifts through the loose material. Attempts to draw the filling failed, as the hanging wall slabbed off, which had the double effect of introducing waste into the ore and blocking the chutes with coarse material. Where the old stope was not over 10 ft. wide it was possible to drive along one wall, necessitating spiling only on one side and in the roof. Often when the old stope was wide, and the filling loose, spiling was necessary at the top and both sides, at the same time keeping narrow breast-boards securely in position.

DRUMLINS are hills composed of glacial till and having strikingly smooth, curving, convex outlines, quite unlike the irregular hummocky surfaces of morainic hills. They may be mammillary, but are usually either oval or elongated as ridges, always with the longer axis in the direction of the ice movement, and are therefore good indices of the direction of glacial flow. These hills are formed beneath the retreating border of the ice-sheet, along the zone where the ice became incompetent to carry its burden. They are sub-glacial heapings of the ground-moraine, comparable to the longitudinal sand-bars in the bed of a river. They are not a common phenomenon in glacial topography.

IF *A* locates a vein, the apex cropping out along the centre line of his claim; and if *B* locates a tunnel-site parallel with *A*'s claim, and cuts *A*'s vein in his tunnel, then, upon the assumption that *A*'s location is valid and prior in point of time to the location of the tunnel-site by *B*, the location of the latter cannot deprive *A* of any rights acquired by his prior mining location. The extent of *A*'s rights will necessarily depend upon the course of the apex of the vein through the location and its position with reference to the end or side lines of the claim. Prior to patent *B* might have a right of way for his tunnel through *A*'s claim, but could not assert any right to any veins which have their tops or apices within the mining location.

THE WORK on a mining claim must be performed annually regardless of the minority of the owner. If not performed, the claim becomes subject to re-location. The law makes no discrimination in favor of minors or other persons under disability, such as idiots, and persons of unsound mind, and in some States "married women." The fact that the owner was left penniless does not help the matter. The minor could have a guardian appointed, and this guardian could, under order of Court, either sell or mortgage the claim. The plea of poverty for non-performance of assessment work, would obviously be a popular one, but if maintainable by a minor would be available to adults, as the law is general in its operation. The fallacy of such a plea is obvious.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanide Poisoning.

The Editor:

Sir—My experience with cyanide poisoning may be of interest to others.

We started our cyanide plant in May, 1903; I attended the solution and was in it a great deal. About August of that year my hands and wrists broke out with what appeared to be skin poisoning from a vegetable source, such as poison oak (*rhus toxicodendron*) or thunderwood (*rhus venenata*), of which there is an abundance here.

I tried all common remedies such as sugar of lead (lead acetate), zinc ointment, sugar of lead and laudanum, etc., with no results.

I consulted local physicians and had prescribed and tried 2% carbolic acid saturated with boric acid, aristol and laudanum in petroleum jelly.

It finally developed into an aggravated case of eczema.

Finally Dr. Peters of Birmingham, Ala., prescribed as follows:

Equal parts ung. ichthyol; ung. boric acid.

Apply locally and continually until cured.

Avoid wetting hands, as water of any kind tends to aggravate the trouble. This cured it in about six months. However, it comes back in spots whenever I get my hands in cyanide solution very much, and especially if I handle precipitate or zinc in the precipitation-boxes; also, the hot gases from our melting-furnace, which contain considerable sulphur, bring it back more quickly and persistently than any other thing.

In cold, harsh weather, it comes back more easily and is harder to cure than in warm weather, similar to chronic eczema.

I have been able to keep my hands fairly free from it, by using the above ointment, and I still attend the solutions.

A. P. KENNEDY.

Yates, Ala., February 16.

Copper in Del Norte County.

The Editor:

Sir—I read with much interest the letter from Mr. James W. Abbott, on the Greenwater district, published January 12, and also your editorial comments on the subject, particularly the one appearing February 16. The point that strikes me most forcibly in this connection is the inconsistency of mining investors—those to whom we must look for the development of our prospects into mines—in rushing into districts like the one under discussion, and 'passing up' others of much greater promise. Is it an illustration of flamboyant advertising, or merely another evidence that the American public likes to be buncoed? To illustrate, I will make a little comparison of the Greenwater district as described in your columns, and the Del Norte district. The Greenwater district has one copper belt in which there are a number of veins showing some gossan and copper oxides on and near the surface. There is little or no sulphide ore in sight, and the oxides are all low-grade; some may be sorted to 8%, and much of it to not over 3% copper. The Del Norte district has at least five distinct copper belts in different geological formations, and separated by spaces of from 5 to 15 miles. Three of these are being developed in a more or less desultory manner, the total amount of work done being somewhere near that done in the Greenwater district. The veins carry a cap of gossan, with here and there high-grade copper oxides showing on the surface. A few feet beneath the surface masses of oxides appear, running from 1 to 60% copper, and a short distance deeper we find sulphide orebodies, some of which will sort to 30%, and many of which will average from 5 to 15% copper. The name of Greenwater is on every tongue, while Del Norte is almost unknown.

JOHN B. PLATTS.

Crescent City, Cal., February 25.

Single-Stamp Mills.

The Editor:

Sir—Mr. J. W. Pinder's letter in your issue of February 2 is both timely and to the point, although in some details I disagree. It may be remembered that I recommended the single, or two-stamp mill, for milling where concentrating was the important consideration, both on account of the greater output for the power required and the less slime produced owing to the rapid discharge of crushed material. I am inclined to favor the wave motion over the plates, for the short interval between waves I believe an advantage. On a concentrating proposition this is of no consequence.

Many superintendents do not favor sizing before concentrating for the reason that it has been tried and failed. Theoretically the measure is correct, but often the machinery is unsuited and unfortunately most superintendents are restricted to the machinery in the mill with no option but to use what has been provided. I have tried sizing before concentrating, with two belt machines, but found that the machine taking the coarse material was overloaded and the machine taking the fine tended to float the slime, whereas, running with an average product the results were better, each machine did good work with much less water, and although some slime escaped, the results were better than sizing. Had this mill been equipped with proper concentrators for the work, I believe previous sizing would have been beneficial, for our trouble was entirely due to sliming of concentrate.

Some ores require inside amalgamation to obtain the best results, for I have tried both methods on the same ore, but there are cases where the results are better without inside plates, in which cases it were best to omit this treatment.

The idea of concentrating before amalgamation is good, depending upon the subsequent treatment of the concentrate. For example, if the concentrate goes to the smelter, well and good, but if to a chlorination, or cyanide plant, the large particles of gold that ordinary would be amalgamated may in this case of previous concentration be lost altogether, for both chlorine and cyanide of potassium dissolve coarse gold with difficulty.

The important point is, that every mill when erected, should be so constructed as to allow of some latitude in the arrangement of the machinery, in order that the management need not be tied down to one special method, whether good or bad, but permitted to arrange the mill according to the requirements of the ore.

ALGERNON DEL MAR.

Cobalt, Ontario, February 19.

RAILWAY ACCIDENTS for the three months ending June 30, 1906, show total casualties to passengers and employees on duty of 19,850. The corresponding total for the preceding quarter was 16,937. The number of passengers and employees killed in train accidents was 267, as against 194 reported in the preceding three months—an increase of 73. The total number of collisions and derailments in the quarter was 3,672 (1,891 collisions and 1,781 derailments), of which 269 collisions and 201 derailments affected passenger trains. The damage to cars, engines, and roadway by these accidents amounted to $2,932,760.

Steel Ore-Bin Construction.

Written for the MINING AND SCIENTIFIC PRESS
By W. R. CRANE.

Present practice in the Lake Superior region favors steel instead of wood in the construction of head-frames, shaft-houses, and ore-bins. The characteristic features of the shaft-houses of the copper country are inclined shafts, the tracks of which are supported upon bents and prolonged upward into massive structures standing some 100 to 125 ft. high, and containing, besides the head-gear, grizzly, sorting-floor and crushers, ore-bins, into which all copper ore of a size for stamping is stored, and from which it is drawn into railroad cars for shipment to the concentrating mills.

The enormous weight of these shaft-houses, when containing bins filled with the heavy copper ore, with their necessarily wide bases, places them in a class by themselves, permitting great height with high hoisting speeds and heavy and large-capacity crushers working far above the ground. Wood was formery employed in this construction; they were of great weight, somewhat difficult to construct, and especially liable to fires, therefore this practice has been largely discontinued, in favor of steel forms. During the winter of 1905–6, the large wooden house at shaft No. 3 of the Wolverine mine was destroyed by fire, and by the middle of the following July a steel structure occupied the same site and was in use, although not working at full capacity. See Fig. 1. Owing to the comparatively short time available for construction, in order that the capacity of the mine should not be seriously reduced, it was decided to erect a steel shaft-house similar to one at the Mohawk mine, under the same management. The great haste with which it was assembled did not permit of making any important alterations, the order being duplicated, except for some minor details, such as position of stairs, tramway, etc. The following notes and sketches descriptive of the ore-bins were taken by the writer and are given herewith, by the courtesy of Mr. Fred Smith, agent of the mine:

Fig. 1. Shaft No. 3, Wolverine Mine.

The bin was built upon the foundation of the former wooden structure, being a strongly built masonry wall enclosing a rectangular space, filled with broken stone, and capped with concrete. The concrete cap forms the bottom of the bin, which consequently is flat. The remaining portion of the bottom of the bin has a slope of 38°, which is the angle of repose of the ore, and also, as it happens, that of the dip of the lode. By choosing this angle instead of 45°, as is commonly used, greater capacity is possible with less height of bin.

The dimensions of the bin are as follows: Top and bottom, width about 38 and 19 ft., length 47 ft.; the sides adjacent to and opposite the inclined bottom are 11 and 28 ft. high, respectively. The inclined portion of the bottom is supported, as shown in Fig. 2, by 20-in. I-beams, connection being made between these horizontal beams and others supporting the sloping floor by means of gussets, which are re-inforced with angles. The floor planks are attached to 12-in. I-beams, cut in sections set between and attached to the gussets and 20-in. I-beams, as shown by angle connections; in a similar manner connection is made between the 12-in. I-beams and columns, except at *A*, where a continuous I-beam is used, the flanges being cut away to permit the web to be riveted to the side of the columns.

There are five rows of columns, composed of built up I-beams, which run parallel with the bin longitudinally; all of these, except the end ones, stand with the longer dimension of their section normal to the bin transversely, thus all of the outer columns have the same relative position with respect to the body of the bin. See Fig. 4. The object of this arrangement is to facilitate the placing of the lining planks of the bin, which are spiked to 4 by 10-in. timbers, bolted to the flanges of the columns. See *A*, Fig. 5. The corner posts on the shaft, or front, side of the bin are specially built angle-columns, consisting of two 15-in. plates, connected by a 6 by 6 in. angle and four 4 by 4 in. angles. See Fig. 4 and 5. The columns in the interior of the bin have 4 by 10 in. pine planks bolted between the legs of the angles, in order to protect them from the cutting action of the ore. The bracings of the columns within the bin are as simple and effective as possible, so as not to interfere with the movement of the broken ore.

The beams supporting the crushers are securely braced longitudinally by angles attached at points nearly opposite their ends and extending from column to column until the sides of the bin are reached, to which they are securely tied. The crushers are mounted directly upon channels, two to a side; their position with the enclosed timbers is shown in Fig. 5. These channels are supported on the shaft end by a 48-in. built-up I-beam (angles and plate), which is stiffened by angles spaced 24 in. apart. Upon the lower flange of this beam the channels are mounted, being connected with angles to the web or plate. This beam is in turn supported by three of the bin columns, and is tied to the adjacent ones on either end. A similar support is provided for the other end of the crusher-supports, except that in this case the channels rest upon the top of a 24-in. I-beam (composed of angles and plate). The three short columns supporting these beams, fore and aft, are braced by angles, as shown in Fig. 5.

The tops of the columns surrounding the bin are tied together with 12-in. channels, while those within the bin

are tied to one another and to the side and end columns by I-beams, which extend both longitudinally and transversely throughout the bin. The longitudinal members are the lower of the series, while those running transversely are the floor supports.

The method of attaching the longitudinally placed I-beams to the tops of the columns is shown in Fig. 5. They vary in size, from the front to the rear of the bin, to accommodate the load that they are to support, being made especially large at the rear, in order to support, with little vibration, the engine situated at that point on the crusher-floor above. These beams, taken in order from left to right (Fig. 2), are: 12, 12, 15, 19, and 12 in. respectively. The bin is braced on both front and rear sides by 4 by 4 in. angles, placed as shown in Fig. 3.

The head-frame is constructed directly upon the bin, the top of the latter being considered as the ground-level in the design of the former. The three middle columns, fore and aft, of the bin are continued upward, forming the main posts of the head-frame, which, together with the remaining columns, constitute the frame-work of the housing for the crushing and sorting floor. The three middle columns, which enter directly into the construction of the head-frame, are made sufficiently large to support the sheaves and resist the strains peculiar to hoisting, also wind pressure, all of which are in addition to the weight of the bin. No back-stays or braces are needed, as the height of the head-frame, thus considered, is moderate, and owing to the fact that the angles made by the hoisting rope with the horizontal on both shaft and hoist sides of the frame differ by only 10 or 15 degrees, the resultant of the hoisting forces falls well within its base.

The floor of the engine is re-inforced with concrete, which is tamped between the supporting I-beams, being held in place temporarily by sheets of corrugated iron bent in arches (convex side up), the ends resting on small intermediate I-beams set into the larger ones and spaced from 18 to 24 in. apart.

A small bin for 'mass' (chunks of native copper), 9 ft. long by 8 ft. wide and 9 ft. deep, is built into the upper right-hand corner on the side of the main bin, facing the shaft. See Fig. 2 and 4. This bin is connected with a discharge opening, in line with the others on the inclined bottom of the bin, by means of a semi-circular iron chute, furnished with an adjustable apron similar to the other gates. These adjustable chutes serve two purposes, namely, they act as gates to regulate the flow of ore or to stop it altogether, and when properly manipulated by the controlling levers, assist materially in filling and distributing the ore in the cars. When not loading into cars, the chutes are hung up by tying the free end of the controlling levers to the plank walk below. See Fig. 2.

Two 14 by 14 in. timbers are bolted together and set in the masonry bottom of the flat portion of the bin and are continued up to the crusher-floor, where they serve as a stool for an air-hammer used in reducing the large masses of rock and copper that are too hard and too securely bound together to be broken by hand. Directly back of the hammer is the opening into the mass-copper bin. All pieces of copper from fist size up are thrown into this bin and thence by the metal chute to a car for shipment di-

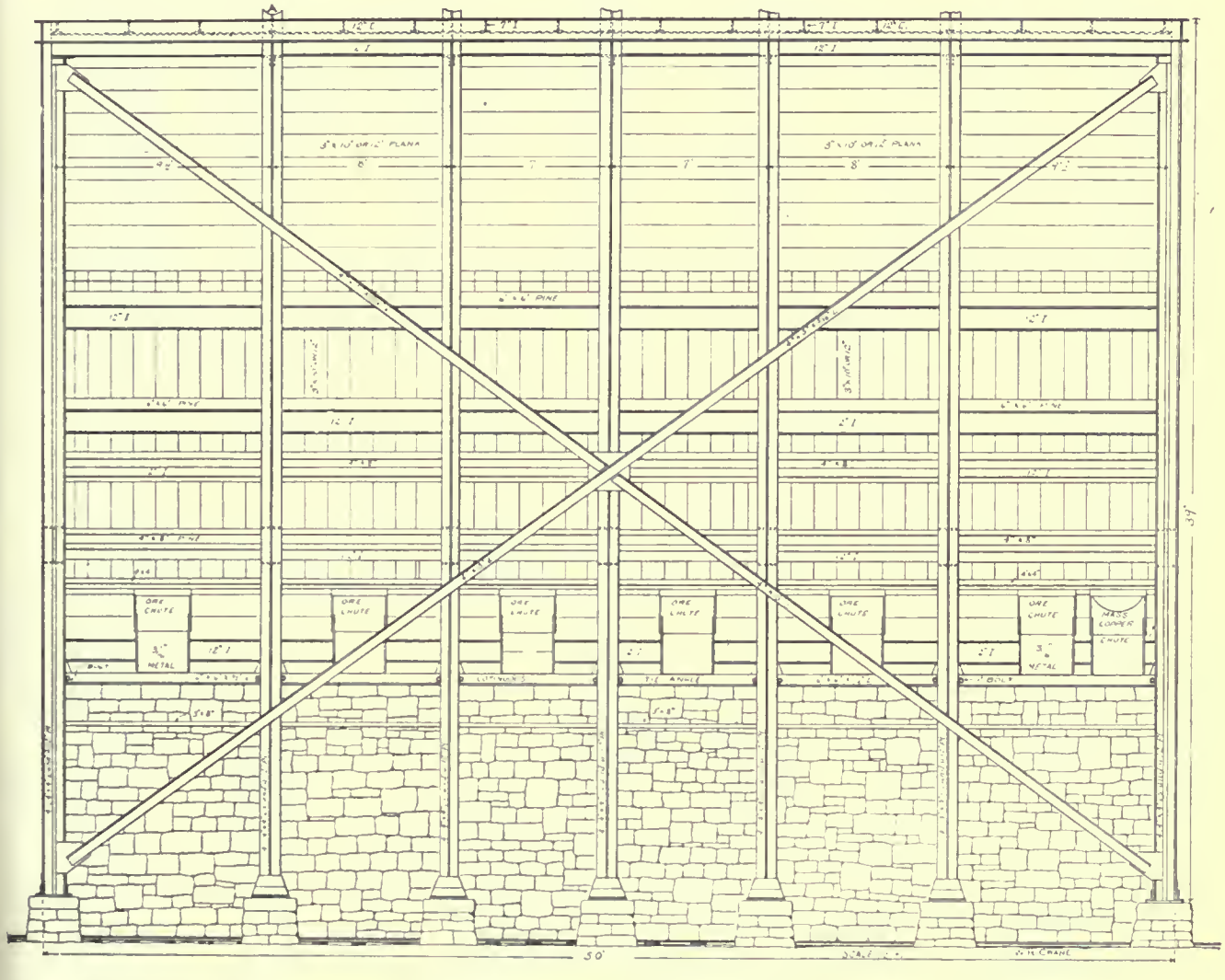


Fig. 3. Rear Elevation of Steel Ore-Bin.

rect to the smelter. The large masses of copper ore are handled by an air-hoist operating on an overhead crab, which also serves as a convenient means of handling repairs for crushers, engine, and grizzly. See Fig. 4. Large pieces of waste rock may in like manner be transferred to the waste chute to be loaded into cars, by which they are delivered to the dump. The grizzly, onto which the copper ore is dumped from the skips, and by which it is roughly sized, is composed of twenty-two 3½-in. round rods, spaced 3½ in. and inclined at an angle of 45°. The undersize from this grizzly goes directly to the bin below, while the oversize is delivered to the crusher-floor, where, being reduced to the proper size, by hand or air-hammer, it is fed to the crushers. See Fig. 4.

The total capacity of the bin is 42,417 cu. ft., or taking 21 cu. ft. of broken ore to the ton, the capacity is 2,020 tons. The capacity of the mass-ore bin is 648 cu. ft. The width of the flat-bottomed portion of the bin is such that a certain portion of ore is permanently held between the horizontal bottom and a plane coinciding with the angle of repose of the ore. The amount of idle ore is still further increased by the fact that the discharge openings are on the inclined portion of the bottom, which does not extend to the flat portion, but terminates at a point some 3½ ft. above it, connection being made between the two portions by a vertical wall. The actual amount of space occupied by inert ore is 9,153 cu. ft., or 435 tons; this means an initial loss of so much capacity. The actual capacity of the bin is the amount of ore that will fill it up to the bottom of the crushers, from which must also be deducted that portion of the mass-copper bin that extends below this point and the space occupied by the idle ore; the available space then amounts to 25,760 cu. ft., or 1,227 tons.

The Wolverine design is an excellent example of present practice in ore-bin construction; but as shown here, without the superimposed head-frame, it would appear to be rather massive, and in fact it is rather heavy from any standpoint, in this respect emphasizing the prevailing tendency in design of similar constructions for mine equipment.

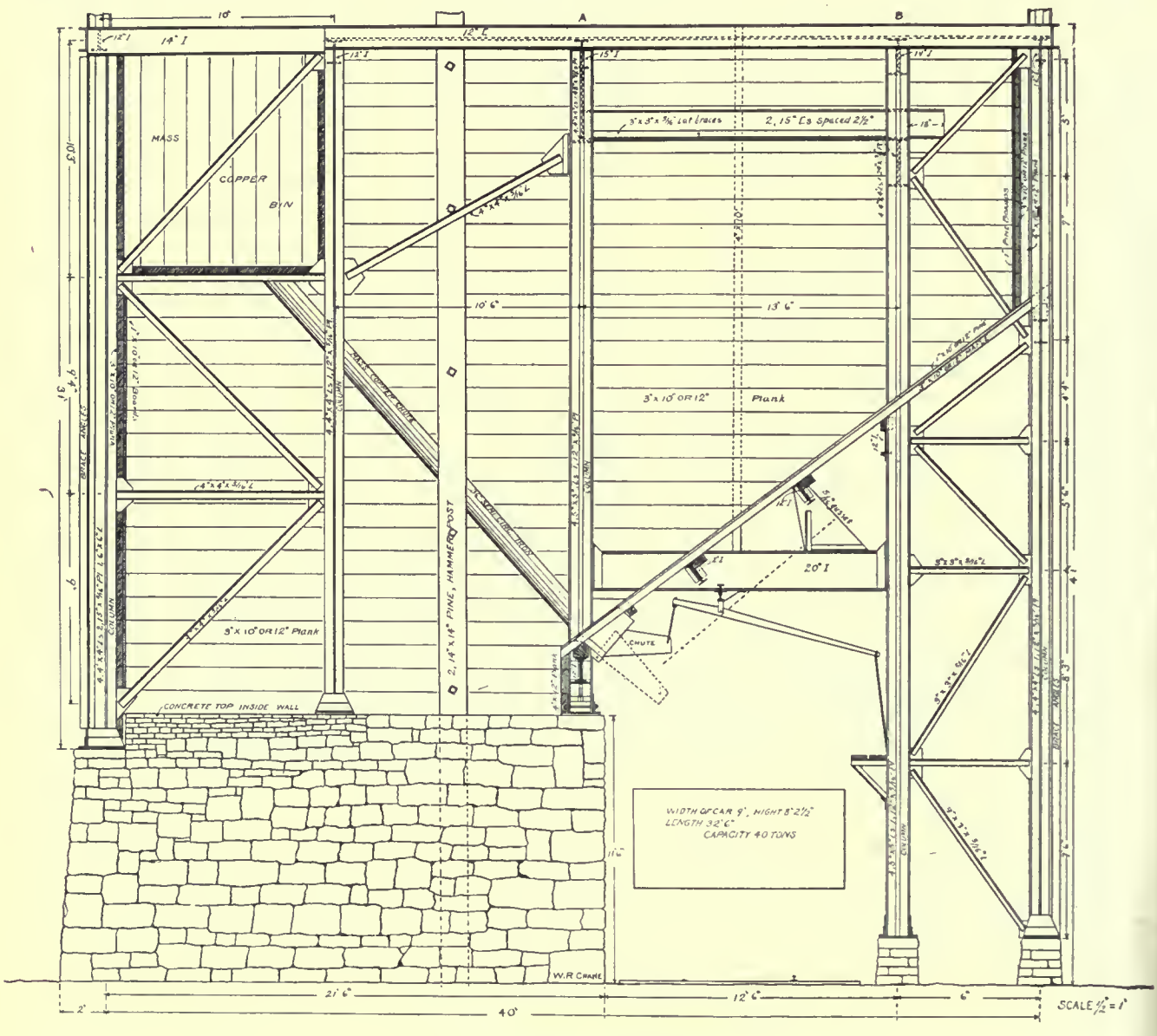


Fig. 2. End Elevation of Steel Ore-Bin.

SCIENTIFIC induction in its essence is simply common sense. The homely maxims of human experience are the beginnings of science. To know enough 'to come in when it rains' is to know something of the science of meteorology. By scanning the clouds we may know how to come in before it rains. By observing the winds we may tell what clouds are coming. By studying the barometer we may know from what quarter the winds and clouds may be expected.

THE general term jigs is applied to that class of concentrating machines in which the separation of the mineral from the gangue is accomplished on a screen or bed of material, and is effected by pulsating up-and-down currents of some fluid medium.

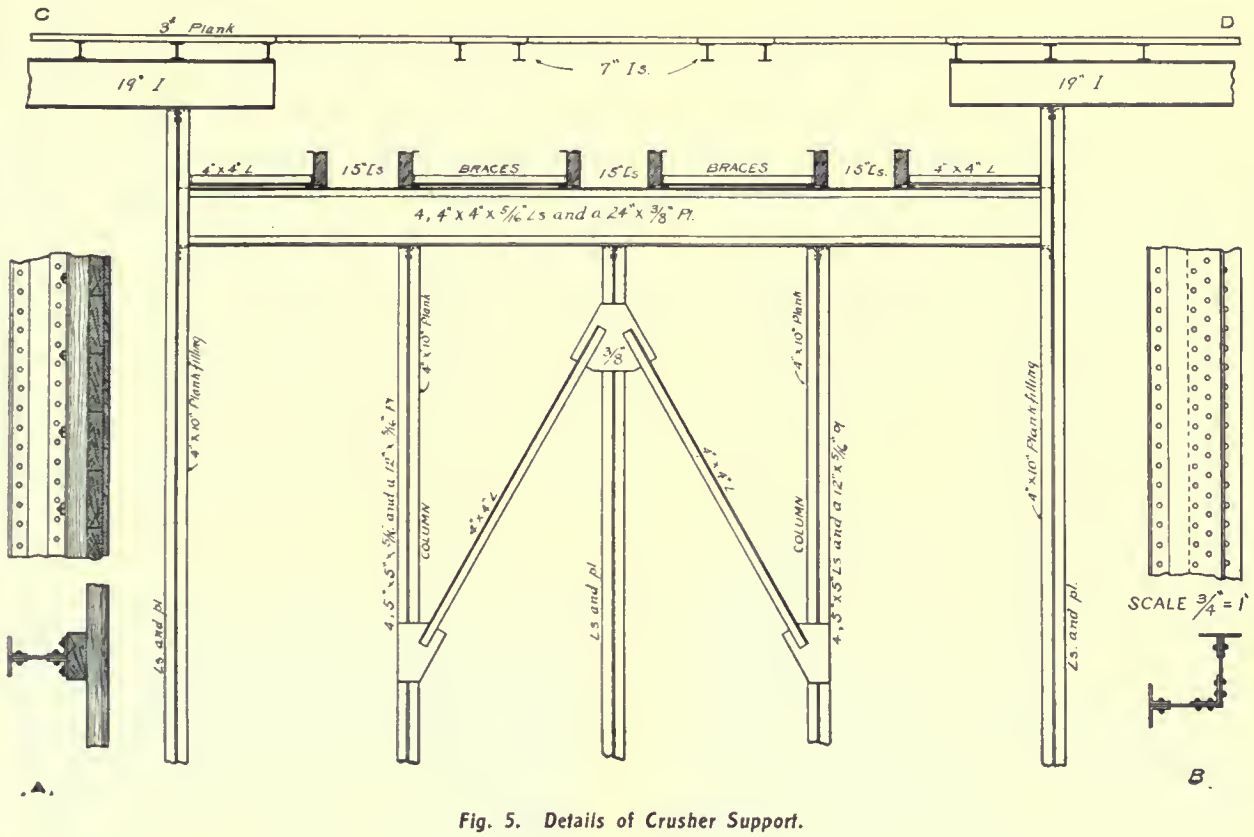


Fig. 5. Details of Crusher Support.

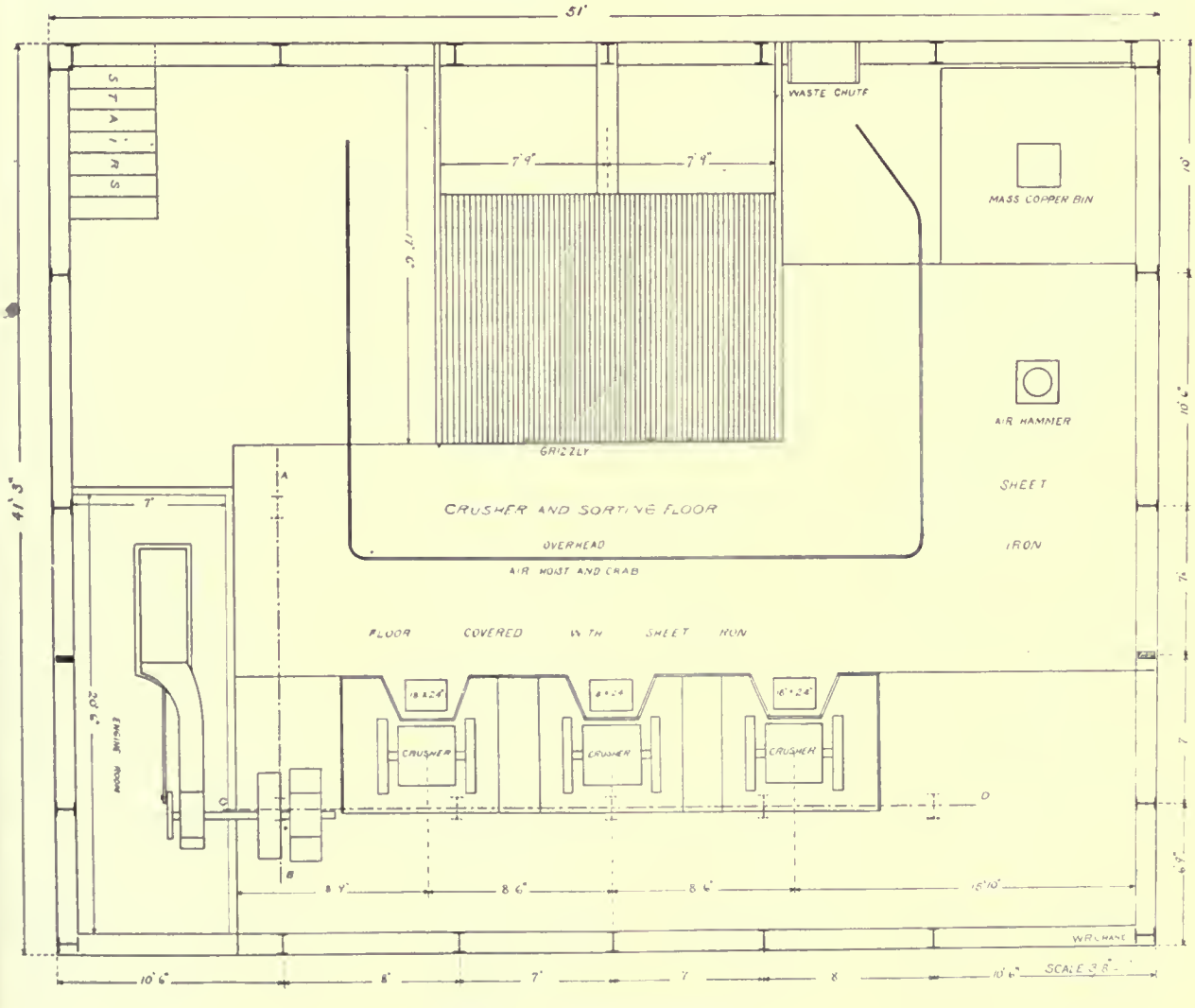


Fig. 4. Plan of Crusher Floor.

The Vulture Mine, Arizona.

Written for the MINING AND SCIENTIFIC PRESS
By C. W. PURINGTON.

In his paper read before the American Mining Congress,* Mr. T. A. Rickard has brought up for discussion and elaboration the vast subject of the geological distribution of gold. The mining community is indebted to him for an interesting presentation of a fascinating theme. It is a striking fact showing the futility of the older geological generalizations, to which Mr. Rickard refers, that there are important gold deposits in the Rocky Mountain region, both in Algonkian schist, as at the Vulture mine in Arizona, and in late Tertiary lava, as at the Camp Bird mine, in the San Juan region of Colorado. From each of these deposits over seven million dollars in gold have been produced.

These localities are within a distance of five hundred miles of each other. In a subsequent paper I shall hope to call attention to the Silverton district of the San Juan mountains, in which productive gold veins are found in Archean gneiss and in Tertiary andesite, within the limits of a few square miles. From the pre-Cambrian schist of Western Australia, according to Mr. Waldemar Lindgren, $267,000,000 in gold has been produced since 1886. From Cripple Creek district in Colorado, since 1890, about $125,000,000 in gold has come mostly from Tertiary andesite.

As late as 1854 J. D. Whitney was content to adopt the dogma of Murchison that gold was limited in its occurrence to the Archean and lower Paleozoic rocks; at the same time admitting the age of the recently discovered gold-bearing rocks in California to be still in doubt.

What seems more important than the consideration of the horizon or the particular rock in which the gold vein happens to exist, is the period at which the fracturing took place; and also the age of the particular occurrence or recurrence of vulcanism responsible for the deposition of the ore contained in the fracture. Fruitless indeed at this date, in the present stage of geological intelligence, seem the speculations of Murchison and his time.

Lithological composition exercises in certain cases an important influence on the nature and amount of ore deposited by metasomatism, or in spaces of dissolution. A certain hazy recognition of such influence generally constitutes the sum of geological knowledge possessed by the self-styled practical miner.

A proper sequence of physical and chemical conditions, which may occur in any period of geologic time, or may subject rocks of any lithological composition to its influences, is responsible for the existence of gold deposits. Hot springs are known to have deposited gold within the last fifty years. On Unga island, Alaska, the Apollo mine is in fresh dacite country rock, within sight of a steaming volcano. It is certainly in post-Miocene rock, and the fracturing and subsequent filling of its fissured zone may have occurred in historic time.

The spectacular gold discoveries of Colorado and Nevada within the past few years have been in Tertiary lavas. It is worth recalling that there are also in the Cordilleran region, as in Arizona, important gold occurrences in ancient schist. For this reason I refer to the Vulture mine.

Fig. 1. Outcrop of the Vulture Vein.

Fig. 3. Open-Cut on Vulture Vein.

This mine is situated in the west central part of Arizona, on the north border of Maricopa county, 20 miles southwest of Wickenburg, on the line of the Prescott & Phœnix Railway. The mine is 2,000 ft. above the level of the sea, and the low range of desert hills in which the vein occurs rises gradually to an elevation of 200 ft. above the plain. The nearest water is in the sinks of the Hassayampa river, 15 miles east, the intervening country being a gradually descending plain. It is said that wells in the bed of this river encounter water for mining and milling purposes at moderate depth. Mills have been erected since the opening of the mine in 1863, at three different places, all using the water of the Hassayampa. The first mill was at the river; another, known as the Smith mill, was 10 miles east of the mine; and the last mill of 80 stamps was at the mine itself, water for the batteries being pumped from the river against a head of 500 feet.

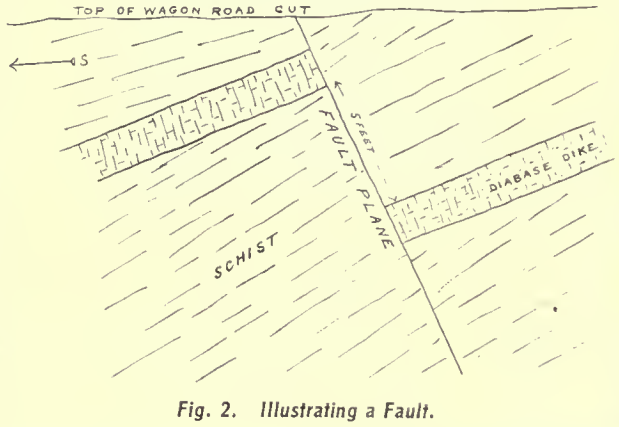


Fig. 2. Illustrating a Fault.

The country between the mine and the railway, and as far in any direction as the eye can reach, is of typical desert character—generally flat, with occasional low jagged hills. The most prominent topographic feature is Vulture Peak, several miles to the east, a mass of volcanic rock.

What little can be learned concerning the history of the

*The paper mentioned appeared in the MINING AND SCIENTIFIC PRESS of October 20, 1906.

mine is of sinister character. Discovered by Americans in 1863, the account of its riches spread through the Southwest. Some of the pioneers of quartz-mining faced the difficult problems connected with its operation. Swarms of nondescript laborers, desperate and adventurous nomads of the West whose origin and careers are alike shrouded in oblivion, made for a time a settlement in that awful desert. For twenty years the Vulture vomited its golden stream. Dim rumors of pillage and of tragedy sift through the years. Popular account says that the Indians shot down men at the stamp batteries.

As nearly as can be learned, 700,000 tons of ore were mined and treated from the Vulture, from which an average of $10 per ton in gold was recovered. The ore was of variable tenor, rich pockets occurring in all parts of the workings, and the mine was finally abandoned not because the ore became too low-grade at the moderate depth attained, but for the reason that the orebody was completely lost. A six foot sample taken from a pillar, in 1906, at 300 ft. down in the west incline gave 0.9 oz. gold. The year 1873 seems to have marked the cessation of deep exploration, and from about this time until 1885 the large mill at the mine was run on the low-grade ore that had been left in the upper workings by the earlier operators. Since 1885 only small attempts have been made to operate the mine under lease, and the tailing at the mills has yielded a small return by cyanidation.

The country rock is sericite schist of probable Algonkian age. It is certainly pre-Cambrian. It forms a low ridge with east and west trend about one mile in length. It extends five miles east and five miles west, and distances of at least one mile to the north and to the south of the Vulture mine. The strike of the schist is north 75° west, dip 35° northeast. The main Vulture lode is a quartz vein six feet wide intercalated with the schist. Other smaller veins, also intercalated, and intermediate mineralized country rock, make a mass of lode-matter, which was worked as ore from 10 to 30 ft. in width. There is no reason to doubt that similar intercalated veins exist in the schist, buried beneath the desert alluvium both to the north and to the south.

The hand specimen of the schist taken from the hanging wall of the lode shows an intimate fine-grained mixture of sericite and chlorite, with numerous almost microscopic crystals of a dark silicate, which I take for garnet. There is also magnetite in considerable quantity. The white silvery mica is the predominating constituent. The character of the ore taken from the outcrop shown in the photograph, Fig. 1, is a dark fine-grained aggregate of quartz, penetrated with a net-work of secondary glassy quartz stringers. The dark primary quartz carries fine, almost microscopic, sulphides. Small vugs contain crystals of wulfenite. I understand that lead, molybdenum, vanadium, and copper in rare compounds and in a fine state of division have been recognized in the concentrate. A secondary silicification is very apparent, and seems to have affected alike the original vein-filling and the adjacent country-rock. The appearance of the ore suggests that secondary enrichment of the gold has occurred, but my inspection of the old workings, to the 350-ft. level on the incline, did not establish the fact that the lower limit of this enrichment had been reached.

The structural features of the deposit are interesting. The case of a well-defined lode of quartz intercalated in sedimentary schist lying in inclined position is to some extent similar to the occurrence of the Main Reef on the Rand. The geological conditions are complicated at the Vulture by faulting. Previous to the faulting, diabase dikes were intruded in the schist, parallel with it in strike but slightly less steep in dip. Cutting the schist, the dikes, and the Vulture vein are narrow fissures some of which are filled with quartz while others are unfilled. These strike north 50° east, and are either vertical or inclined steeply to the southeast. Reverse faulting has occurred along these fissures, the north portion of the vein and beds being in every case lifted up to the north, with a throw of moderate degree. The sketch, Fig. 2, shows an observed case, about 500 ft. southwest from the outcrop of the vein. There are many evidences of this faulting, and detailed study of the mine workings would probably establish the fact that the orebody has been successively lifted to the north. A series of such faults close together would result in a total throw of considerable magnitude. Rumor concerning the former work says that the orebody was lost in depth. If the ore deposit persists in depth, cross-cutting to the north would find it, as there can be no question that the vein itself continues downward. The deepest point now accessible is the so-called 400-ft. level of the west incline, below which water stands in the mine. Even at this level it is apparent that the main vein lies in the north or hanging wall of the incline.

In 'Mineral Resources West of the Rocky Mountains,' 1874, it is stated: "Up to the time that operations stopped on the Vulture (sinking operations on the east end, above referred to, about 1872) prospecting in the lower shaft was carried on with as much energy as circumstances would permit, and from the work done it is clear that the Vulture is a true fissure vein of large proportions. The depth attained on the mine is 312 ft. below the surface of the mesa, or fully 390 ft. below the croppings of the lode. At a depth of 232 ft. below the surface of the mesa the fissure was found to change from a dip of 45° north-northeast to an almost vertical position." * * * * "It may be here mentioned that the best body of ore which was taken from the mine was found just above where the fissure changed its dip." * * * * "After sinking 50 ft. behind the foot-wall, from the 232-ft. level the fissure was cross-cut and found to be 47 ft. in width and having on the hanging wall a seam of blue clay some 12 or 15 in. thick. Outside of this was the hanging-wall rock peculiar to the mine above, but the fissure throughout its width was found to be filled with a hard black rock full of iron pyrites, and some galena." * * * * "The shaft was then sunk 30 ft. farther, and a cross-cut was again made." * * * * "The vein-stuff had again changed somewhat, this time for the better; a little more quartz, from which some fine gold was taken, having made its appearance." "As soon as the vertical fissure was struck, water also began to make its appearance, and it increased steadily, though slowly." "This cap, to judge from developments made above, rises gradually toward the east, and dips westerly along the line of the fissure, with the same inclination that way as that which the pay-shoots of ore had above. They were all found to run diagonally west across the dip of the vein."

The above language, being interpreted, means that near the east end of the deposit, about 1,200 ft. east of the incline-shaft before referred to, exploration in depth got off the main vein, and followed instead one of the vertical veins of later age, which have been responsible for the faulting of the main orebody. It does not appear that any more work has been done at the east end since the cessation of that above described. There was no change of dip from "45 degrees" to vertical, but the vertical shaft encountered an entirely different vein, the main Vulture lode lying still farther to the north.

For a length of over 1,500 ft., a width varying from 10 to 30 ft. and to a depth on the dip of the vein of from 300 to 400 ft. the orebody was stoped out, large pillars being left for support. Since 1885, the date of the last extensive work, two enormous caves from surface have occurred,

so that the mine now has the appearance of a series of great open-cuts, their walls honeycombed with a network of lateral chambers. A sense of awe strikes the beholder who looks on this scene of utter desolation and decay.

The Algonkian schist occurs in patches far to the eastward and to the north. In the vicinity of Jerome, 100 miles to the northeast of the Vulture, similarly intercalated veins in schist pass upward, according to T. A. Jaggar and Charles Palache, into overlying horizontal Carboniferous rocks. The age of these veins is consequently post-Carboniferous. At the Congress mine, 35 miles to the north, an intercalated vein in schist has been worked for gold to the depth of 4,000 ft. on the incline. I cannot say whether it is conformable in dip and strike with the Vulture occurrence. I have examined a portion of the Pinal schist area in the Globe district, 150 miles to the east of the Vulture, and find a considerable similarity in appearance.

Sericite is abundant, although there is a greater amount of elongated quartz nodules. The Globe schist is called pre-Cambrian by F. L. Ransome. It contains visible flakes of copper pyrite, and certain belts of it are mined as copper ore. Assays of $3 in gold can be obtained in places, as at the Cole & Goodwin mine. It is probably safe to refer the first mineralization of the Vulture lode to Permian age while it is almost certain that a second series of nearly vertical veins cutting the schist was subsequently formed, and by the agency of their filling the older veins were enriched.

In general, attention should be called to the fact that the pre-Cambrian schist of Arizona has a wide distribution and contains notable orebodies. A geological map of Arizona showing this distribution may some day prove an important guide to the sensible prospector. We are indebted to Mr. Rex Beach for an Alaska "sour-dough's" rendition of the legend of the Golden Fleece, in which he asserts that the "Augernots" abandoned their search for gold when they found the "formation was like Texas, not right for mineral," so they went into the "sheep business." The prospector should realize that "mineral" will "live" in old formations as well as new, and that gold may be awaiting him encased in Algonkian schist as well as in "phonerlite" or in rhyolite.

SODIUM TRANSMISSION LINES.—The use of sodium for overhead transmission is attracting the attention of electricians. It is said to be cheap and a good conductor of electricity, but as its marked affinity with oxygen causes it to ignite when placed in contact with water, its employment in the form of a conductor would be limited, probably, to overhead transmission lines or feeders for railway work. The general process of constructing sodium conductors is to take standard wrought-iron pipes and heat them to a point well above the melting temperature of sodium. The sodium is then melted in special kettles and is run into the the pipes, solidifying when cool. There is said to be no marked depreciation of either the sodium or the pipe if the latter be properly protected by a coat of weather-proof paint. For the same conductivity the price of the complete sodium conductor is much below that of copper cables, being in small sizes not more than 50% and in large sizes not more than 20% of the cost of copper. For instance, a half-inch wrought-iron pipe filled with sodium has a capacity of 109 amperes, and costs about 3½c. per ft., against 8½c. for a copper line of the same capacity. A 6-in. sodium conductor would carry 8,130 amperes, the cost of the line being about $1.40 per linear foot, as compared with $6.30 per foot for copper. These figures were estimated on the basis of 7½c. per lb. for sodium and 16c. per lb. for copper.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The locators of a mine, on the day of a location, posted notices thereof, set stakes at the northeast and southwest corners of the claim and remained thereon until twelve o'clock midnight of the same day and immediately left the claim and never did anything further in the way of taking possession thereof. Three months thereafter another person made a new location of such claim. Under these facts it was held that the first locators did not proceed far enough to acquire rights sufficient to make the claim abandoned property within the meaning of the statute, and that the re-location was sufficient, though the certificate did not state that the whole or any part of the new location was located on abandoned property, where it further appeared that the re-locators complied with the requirements of the statute by sinking a discovery shaft upon the lode.

Paragon Min. &c. Co. *v.* Stevens, Co. &c. Co., (Wash.) 87 Pac. 1,068.

Two persons owned an undivided half-interest in a mining claim. One of such owners continued a tunnel driven on the claim through such claim to another mine owned by him, and thereafter worked his mine and attempted to convey the output through such tunnel, basing such right on the fact of his joint ownership of such mine. In a controversy over such right it was held that the owner of an undivided interest in a mining claim had no right to use a tunnel driven on the claim to convey ore from an outside claim.

Laesch *v.* Morton, (Colo.) 87 Pac. 1,081.

Where a purchaser of coal refused to take the quantity specified in the contract, and where it appeared that a custom among coal dealers made it necessary that such a contract be made, and the mining company in reliance on such contract only contracted with others for the balance of its output, it was held that in an action for the breach of such contract, that the damages should be computed by deducting from the contract price of the undelivered coal the original cost of the coal and the expense of mining it.

Thistle Coal Co. *v.* Rex Coal &c. Min. Co., (Iowa) 109 N. W. 1,094.

It is said that the locator of a mine, without obtaining a patent, acquires the possessory title thereto against all the world, and as against the Government so long as he performs the annual amount of work required thereon; and he may transfer this possessory right or title to a purchaser, who may, as the apparent owner, hold it against unrecorded equitable claims, without notice. The purchaser of the legal title of a locator has a prior and superior equity over a claimant of a prior equitable interest only.

Reed *v.* Munn, 148 Fed. 731.

The United States statute requiring the notice of the location of a claim to contain a description by reference to some natural object or permanent monument as would identify the claim, was held to be sufficiently complied with under a system of locating placer mining claims upon a gulch or creek, and calling the first 'Discovery Claim,' and then numbering the others from this first claim up or down the gulch or stream, and giving to the side or bench claims the same number as those upon the creek, with the addition of a letter of the alphabet. And that a recorded notice of the location of a claim in such locality, describing it as "13 A. Below Discovery on Cleary Creek," was held sufficient.

Smith *v.* Cascaden, 148 Fed. 792.

A person residing in a tent on one of a number of adjoining mining claims owned by him, and who had commenced the sinking of a shaft thereon, was held to have sufficient possession to entitle him to maintain an action against an adverse claimant of the ground.

Lange *v.* Robinson, 148 Fed. 799.

Mining in South Africa.

Contributed to the MINING AND SCIENTIFIC PRESS
By J. B. PITCHFORD.

*South Africa extends from the Cape to the Zambesi river, about 1,700 miles, covering an area of 1,400,000 square miles. It includes Rhodesia, the Transvaal, Swaziland, Basutoland, Natal, Orange River Colony, Cape Colony, Zululand, and Beehuanaland. The native population including Portuguese Territory is about 5,000,000. The area of Rhodesia is 750,000 square miles. The Transvaal is 126,000 square miles in area (about four-fifths the area of California).

The most important gold discoveries have been made in the Transvaal where now one-third of the total gold output of the world is produced from a stretch of gold-bearing lodes 60 miles in length. The Transvaal was a bankrupt country in 1877, but it is now producing gold at the rate of $120,000,000 per annum.

The white population of the Transvaal is about 300,000; of these, 114,000 live in the vicinity of the mines. There are 100,000 natives and 53,000 Chinese employed on the mines of the Witwatersrand and there are about 50,000 natives employed in other occupations among the mining towns. The 114,000 white people of various occupations on the mining area of the Witwatersrand are supported by the mining industry and their numbers have increased proportionally as the mining industry has progressed. When the mines were first discovered only the high-grade ore was worked. At the present time the average value of the ore mined and treated is only $8.50 per ton. It requires economical mine management to produce $10,000,000 per month from ore going $8.50 per ton in a country where living expenses are twice as high as they are in the United States, and pay interest on capital invested. The skilled labor is performed by white men and the unskilled labor by negroes or Chinese under the direction of white men.

The white miners and mechanics (not including officials) are paid $4 to $5 per day and the colored labor costs from 75c. to 80c. per day including food. White contractors make from $150 to $500 per month on rock-drill work. Over fifty-five per cent of the mining costs is paid out for wages, and three-fifths of this amount is for white labor including staff officials and clerks. It will be seen that all white labor could not be used for mining eight-dollar ore so as to pay for supplies and interest on capital invested where the conditions are such that it takes four people to mine and extract the gold out of a ton of it, in a country where the cost of living is double what it is in the United States. A mine crushing 500 tons per day is sometimes capitalized at $2,500,000.

Working expenses vary from $5 to $8 per ton. The natives and Chinese are fairly good workers when properly managed. The principal work they do underground is single-hand drilling, shoveling and tramming, and assisting white rock-drill men and other miners. Some of them are proficient at single-hand drilling and they can put down a three-foot hole in quartzite in from two and a half to three and a half hours, and this is considered a shift's work and entitles them to a day's pay.

The gold mines of the Transvaal are situated in a district known as the Witwatersrand, with the town of Johannesburg, at an altitude of 5,500 ft., in the centre. Mining operations are carried on continuously along a distance of 60 miles. There are over 60 producing mines and some of these can pay 20 to 25% interest on their capitalization. The capital expenditure on some of them will average $24,000 per stamp in the mill. The equipment of a mine on a basis of 200 stamps costs from $10,000 to $15,000 per stamp and the balance of expenditure goes for development and in purchase of claims.

A quartz mining claim in the Transvaal is 150 ft. long on the strike of the lode and 400 ft. wide. The Government license fee is $1 per claim per month. In addition to this, the Government takes 10% of the net profit on the gold produced. The Boer Government used to take five per cent of the net profit. Under existing conditions in the Transvaal, it does not pay to organize and equip a mine having much less than 100 claims. The lodes can only be followed within perpendicular lines of the claim-boundaries and this arrangement saves many lawsuits. Overlapping claims are not recorded.

The talent of mining engineers from all parts of the world has been brought to bear at Johannesburg and no expense has been spared to obtain good organization and up-to-date equipment. Complete statistics are kept at all the mines on a basis of costs per ton mined and milled, and rigid comparisons are made between those mines working under similar conditions, so that each manager or superintendent is held accountable to his directors for any excess in his costs per ton over that of his neighbors.

Costs are subdivided as follows: Mining, Hoisting, Pumping, Transport, Sorting, Crushing, Milling, Cyaniding, Electric Power & Lighting, Maintenance, Development, and Office Expenses. The total cost per ton of ore mined ranges from below $5 to $8 at the present writing. Twelve years ago the total cost per ton averaged $2 more, and a still further reduction may be looked for if the people that read about the natives in missionary books six thousand miles away will allow the white people living in Africa, who understand natives and other local conditions, to manage their own affairs. At the present time one-third of the unskilled labor is Chinese, one-third negroes imported from Portuguese territory and one-third negroes accumulated from British colonies extending over a distance of 1,700 miles. All this unskilled labor has to be dealt with fairly and controlled properly in order to carry on a large industrial enterprise. The natives, as a rule, prefer to stay on their land, or work in stores or houses to working in the mines.

It is significant that, under the present working conditions, 55% of the working cost is paid out for labor and nearly three-fifths of this is for white labor. About 11% of the working cost goes for explosives and 8% for coal. The remaining 26% goes for stores and maintenance. The average gold output of the Transvaal mines for 1906 was ten million dollars per month and the average value of the ore treated was $8.50 per ton. Some of the richest mines, such as the Robinson, produce ore up to $15 per ton. Underground costs run from $2 to $3.50 per ton, depending on thickness of lode, angle of dip, depth of working, water, etc. The veins worked vary from one inch to 15 ft. in thickness. Milling the ore costs from 50c. to 75c. per ton. Cyanidation and slime-treatment cost from 50 to 75 cents per ton. Stoping is done on contract at prices varying from $10 to $16 per fathom.

Drifts and cross-cuts 5 by 7 ft., in quartzite, are driven by contractors at the rate of $7 to $8 per linear foot. Out of this they have to pay the company 75 cents per day for the natives they employ, 30 cents per lb. for the dynamite, $3.25 per box of candles, 10 cents per coil of fuse, 75 cents per box of caps, and 3 cents per point for each drill sharpened. It takes 3 to 5 lb. dynamite per ton of ore blasted in driving and cross-cutting. Ten to 18 lb. per foot is used for shaft-sinking and 1.5 to 2 lb. for the total tons of ore mined, the larger portion of the rock being quartzite. Each ton of ore mined requires the consumption of 300 lb. coal.

There are three parallel veins in the Witwatersrand,

*A lecture delivered to the mining students of the University of California by Mr. J. B. Pitchford, late manager of the Randfontein Deep mine, Johannesburg.

but the distances between them and their respective thickness vary in different parts of the district. This gold-bearing conglomerate is termed 'banket,' and consists of pebbles cemented together, Sometimes the pebbles are clear and vitreous and sometimes milky or black, and they are frequently surrounded by pyrite in the matrix. The veins vary in thickness from one inch to 15 ft. The specific gravity of 'banket' varies from 2.65 to 3; 11½ to 12 cu. ft. make a ton of ore in place. The latter figure is usually adopted for estimating tonnages in the mine. The workable tonnage in these mines has been doubled in the past ten years in consequence of the reduction of $2 per ton in working costs. The value of the ore that can be profitably mined under existing conditions varies from $6 to $20 per ton, and the average value of the ore milled in 1906 was $850 per ton.

The following example in ore-sorting will be suggestive: A mine contains 7,200,000 tons of ore that will yield $10 per ton. The capacity of the mill is 1,000 tons per day; the hoisting capacity is greater.

The cost of mining and surface expenses is	$6 per ton
" " " milling and cyaniding	1 " "
The net profit remaining will be	3 " "
7,200,000 tons at $3 gives a profit for 20 years' work of	21,600,000
The rate of profit per year	1,080,000
Now $1 per year invested at 5% compound interest for 20 years is	$33.066
Hence $1,080,000 profit per year at 5% interest for 20 years is	35,711,280

This being the total profit of operation at end of 20 years without sorting.

If now 15% of the ore, or 1,080,000 tons, that goes $1 per ton, is sorted out, there will remain 6,120,000 tons to be milled.

7,200,000 at $10	$72,000,000
1,080,000 " $1	1,080,000
6,120,000 at $11.588	70,920,000

Thus there will remain to be crushed 6,120,000 tons at $11.588 per ton.

All the 7,200,000 that is hoisted costs $6 per ton	$13,200,000
Sorting 7,200,000 tons at five cents	360,000
6,120,000 tons to be milled at $1	6,120,000
Total costs	$19,680,000
Product, 6,120,000 tons at $11.588	70,920,000
Net profit	$21,240,000

Or net profit equals $1,249,411 per year for 17 years.

Now $1 per year at 5% compound interest for 17 years equals $25.81. Hence profit of the $1,249,411 per year at 5% compound interest for 17 years $32,284,780

Now $1 at 5% compound interest for 3 years equals $1.1576. Hence at end of three years, $32,284,780 would amount to $37,372,861, or total profit at end of 20 years for sorting system.

Now	$37,372,861	profit at end of 20 years for sorting system,
Less	$35,711,280	" " " " " " non-sorting "
Equals	$1,661,681	which represents increased profit at end of 20 years for the sorting over the non-sorting system.

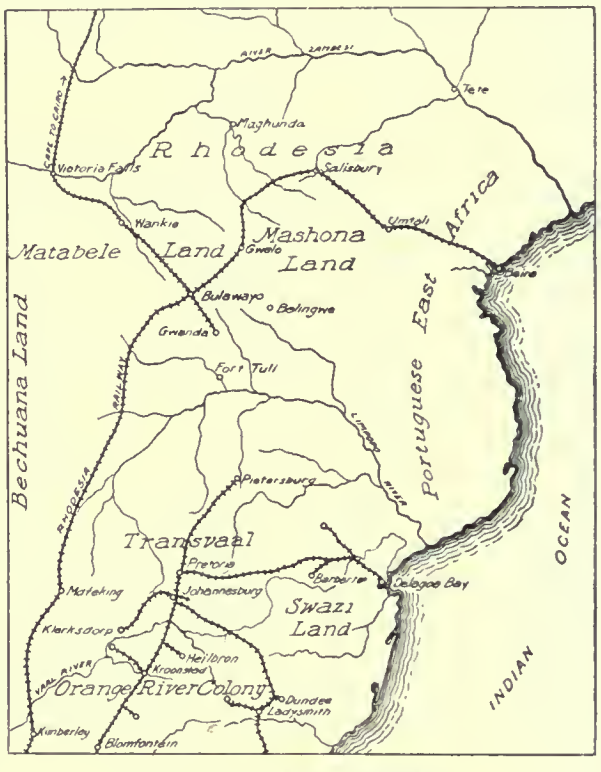
But as the mine would have been worked out in 17 years, the mine-plant could have been sold and realized on three years earlier or used for three years on other property.

These figures are based on sorting after the ore is brought to the surface. Ore sorted underground would save the cost of hoisting.

It is customary to sample the stopes from which the ore is being taken for the mill, in order to keep the grade even and the monthly output regular. The development drifts and winzes are sampled every five feet in short sections, across the stoping width of the lode. The results are recorded on the assay-plans in inches and pennyweights, equivalent to inch-dollars. By determining the assay-value and the width of the lode all around a block of ore, the tons and value per ton can be estimated for all the ore in reserve in the mine. Development work on three sides is sufficient to render an estimate safe, and some mines have as much as two years' development work done in advance of a 200-stamp mill crushing at the rate of six tons per stamp per day. Development work in drifts, winzes, and raises costs from 50 to 90 cents per ton for the ore blocked out. This is added to the mining and milling costs or is written off periodically.

The expenses of equipping one of these mines on a basis of a life of 15 or 20 years involve shaft-sinking at a cost of $100 to $150 per foot; winding engines; air-compressors and rock-drill plant; electrical power and lighting plant; pumping machinery, mills, cyanide works, furnace, and melting houses; buildings for natives and whites, stores and offices, water reservoirs and water-supply installations, and transportation facilities.

Some of the larger mine equipments have cost over $5,000,000. The enterprising people who have invested millions for the development of these mines deserve great credit for the sportsmanlike nerve they have shown in combating difficulties and in running risks for the purpose of building up a profitable industry, which furnishes a large lucrative market for manufacturers and gives employment to thousands of white people in numerous callings, besides promoting a wide distribution of wealth.



Map of the African Goldfields.

(TO BE CONTINUED.)

TEHAUNTEPEC RAILWAY.—The new railroad recently opened for traffic across the isthmus of Tehauntepec is expected to prove of great importance to the world's commerce. For the time being the new route will be directly available for the transportation of American domestic traffic only, the first steamship connections being those provided by the American-Hawaiian Steamship Company. Under a freight contract, which the steamship company signed in 1906, and particulars of of which were given by Special Agent Pepper a year ago, about 300,000 tons of sugar will be shipped annually from Honolulu via Tehauntepec to New York, Philadelphia, and New Orleans. The distance from New York to Honolulu via Tehauntepec is 5,699 nautical miles, while the distance via Panama is 6,688 miles.

THE forces that produce movements of the earth's surface are called 'diastrophic,' and are of two classes. The movements that involve broad, or continental, areas are termed 'epeirogenic,' while those which have to do with the uplift and crushing of belts of land, producing mountain ranges, are called 'orogenic.'

How the Miner's Dynamite is Made.—I.

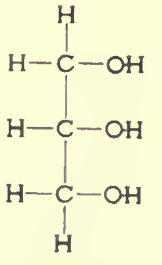
Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

Dynamite is a mixture of nitro-glycerine (which is a heavy oily liquid) and an absorbent, such as wood-pulp. The mixture is preferable to nitro-glycerine alone, because it can be handled as a solid instead of a liquid, and also because a much heavier shock is required to explode it, thus making it comparatively safe to move. The nitro-glycerine is commonly spoken of by men about the works as the 'oil,' and the absorbent material is called the 'dope.' The making of dynamite falls naturally into two parts: First, the manufacture of the nitro-glycerine; and secondly, the mixing of it with the dope and the packing of the dynamite meal thus made into sticks and cases. The making of the nitro-glycerine proceeds in three departments: First, the manufacture of nitric and sulphuric acids; second, the manufacture and separation of the nitro-glycerine; and third, the recovery of as much as possible of that portion of the acids that has not been consumed in making the nitro-glycerine, for use over again.

Explosives are made by obtaining oxygen in some concentrated form and mixing it with a combustible, so that the latter can be burned instantly, without the necessity of obtaining the oxygen for its combustion from a large quantity of air. The gases generated by the combustion and expanded by its heat, give the force to the explosion. Thus black powder is made by mixing charcoal and sulphur, which are combustibles, with nitre (potassium nitrate), which is 47.4% oxygen. In nitro-glycerine, the glycerine is the combustible and nitric acid (which is 71.2% oxygen) supplies the oxygen to burn the glycerine.

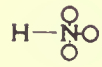
Glycerine is a combustible, just as wood and coal are. It is made from fat, which when treated with steam under pressure, separates into glycerine and stearic acid (from which candles are made). And it is also recovered by the Van Ruymbeke process from the waste liquors left after fat has been worked up into soap. The explosion of nitro-glycerine is much sharper than that of gunpowder, because the oxygen in it is mixed with the combustible in a much more intimate way. Gunpowder is merely a mechanical mixture in which the particles of combustible and the particles of the oxygen-carrier (nitre) are lying side by side. In nitro-glycerine, however, the oxygen-carrier does not exist as a separate particle, but has been injected into the molecule of the glycerine itself. In gunpowder the separate particles are, say, one thousandth of an inch in size, and therefore the elements must move on an average that far when they unite in combustion. But a molecule is supposed to be only a five billionth of an inch in size, and each molecule contains atoms of combustible material and atoms of oxygen. In fact, the atoms are so very close together that they are almost touching, and if we hit the nitro-glycerine a sharp blow we jar them so that the atoms of combustible and the atoms of oxygen are thrown far enough out of their places to come in contact with each other and an explosion takes place. If we jar all the molecules at the same time, then they all explode at the same time, and the explosion is terribly sharp. But if we mix the nitro-glycerine with some less active material and detonate it at one end, then it takes an appreciable amount of time for the jar to travel to the other end of the mixture and the explosion is not quite so sharp. Thus the explosion of dynamite containing 70% nitro-glycerine is much sharper than that containing 40%; and by using only 5% we make a variety known as 'low' powder, which has a lifting instead of a shattering effect, and it is largely used as a substitute for the common black powder. Many of the sporting and military powders contain high percentages of nitro-glycerine. Cordite, the English powder used for rifles and large guns, contains 58%, but the extreme heat of the explosion and the high velocity imparted, erode the bore of the gun to such an extent as to provoke criticism. The manufacture of dynamite is at present in a transient stage. Great advances have been made over the methods in use five years ago. The American hunger for improvements has been just as much in evidence in the powder business as in copper smelting or electric railroading. Experimenting has been incessant. In consequence, many changes and additions have been made at all the dynamite works.

It is impossible for anyone to understand the import of all that is being done in the business without knowing exactly what takes place in the nitrator when glycerine is converted into nitro-glycerine. A molecule of glycerine is composed of 3 atoms of carbon (C), 5 atoms of hydrogen (H) and 3 radicals of hydroxyl (OH). It is represented graphically in Fig. 1, in which each letter stands for an atom. A molecule of nitric acid (which is used to supply oxygen to the glycerine and thus make it



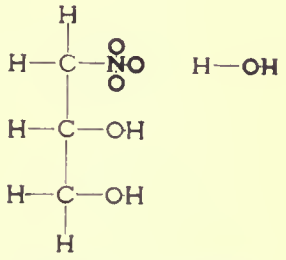
Glycerine

FIG. 1.



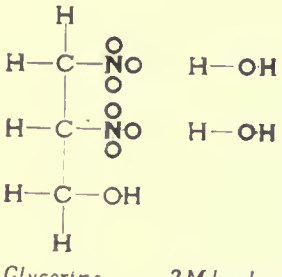
Nitric Acid

FIG. 2.



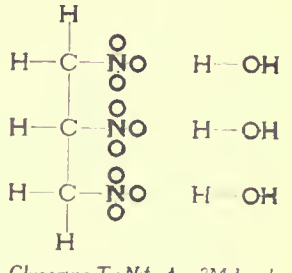
Glycerine-Mono-Nitrate Water

FIG. 3.



Glycerine-Di-Nitrate 2 Molecules of Water

FIG. 4.



Glycerine-Tri-Nitrate or Nitra-Glycerine 3 Molecules of Water

FIG. 5.

combustible) is composed of 1 atom of hydrogen (H), 1 atom of nitrogen (N) and 3 atoms of oxygen (O). It is represented graphically in Fig. 2. What happens to the glycerine when we inject the oxygen-carrier into it? First, the radical of a molecule of nitric acid pushes the hydroxyl of the glycerine molecule out of the combination, and we have glycerine mono-nitrate. At the same time the hydroxyl radical that is pushed out unites with the atom of hydrogen that was formerly combined with the nitric acid, forming HOH (or H_2O), which is just ordinary water. The mono-nitrate and the water are platted in Fig. 3, the radicals which have exchanged places being printed in blacker letters for the sake of accentuation.

Similarly by bringing another molecule of nitric acid to act upon this same molecule of glycerine (or glycerol) mono-nitrate, a second hydroxyl radical can be displaced, forming glycerine di-nitrate and a second molecule of water (Fig. 4). And by acting still more strongly with nitric acid upon the glycerine di-nitrate, we can displace the third radical of hydroxyl and we then obtain glycerine tri-nitrate (which is ordinary nitro-glycerine) and a third molecule of water (Fig. 5). In the dynamite works

the acids are not strong enough to convert all the glycerine into the tri-nitrate, and some of the glycerine never gets beyond the di-nitro stage. In a manner similar to the manufacture of nitro-glycerine we can inject our oxygen-carrier (nitric acid) into other combustible materials such as cotton, wood-pulp, starch, phenol (carbolic acid) and naphthalene; thereby forming gun-cotton (tri-nitro-cellulose), nitrated wood-pulp, tetra-nitro-starch, tri-nitro-phenol (picric acid), and di-nitro-naphthalene. These and many other nitro-compounds are explosives like nitro-glycerine, but they possess some quality which unfits them for miner's use, although employed in military and sporting powders.

Now look again at our map of a nitro-glycerine molecule (Fig. 5) and you will understand why nitro-glycerine can be exploded by a shock. On the left side are atoms of hydrogen and carbon, which are both inflammable. On the right side are nine atoms of oxygen, more than enough to burn up all the carbon and hydrogen atoms. Between the oxygen and the combustible atoms, preventing them from coming in contact, are three atoms of nitrogen (N). But if you jar the nitro-glycerine by a sharp blow, such as the stroke of a hammer or the explosion of a detonating cap, then the oxygen atoms get shaken out of that fine acrobatic balance they have been in, and coming in contact with the combustible atoms, the latter all burn up instantly. The hydrogen atoms combine with the oxygen atoms to form water (steam), H-O-H, the carbon is burned to carbon dioxide (carbonic acid gas) O-C-O, while the nitrogen is set free as hot nitrogen gas. The liberation of these three gases in the small space formerly occupied by them when they were nitro-glycerine, expanded still further as they are by the heat of the combustion (temperature 5,700° F.) gives the disrupting force of the explosion.

By adding up the weights of the atoms in the formula given above (Fig. 5) any chemist can figure the weights of the materials that take part in a perfect reaction. If there is a perfect nitration, 100 lb. glycerine will combine with 189 lb. (pure) nitric acid, and as a result of such a complete reaction there will be formed 246.9 lb. nitro-glycerine and 55 lb. water.

In practice, however, it has never been possible to obtain so much nitro-glycerine as that. The nitration of glycerine only takes place when we employ very strong nitric acid. You will note in Fig. 5 that every time we form a molecule of nitro-glycerine we form three molecules of water. This water dilutes the mixture so that the nitric acid is soon too weak to have any further action on what remains of the glycerine. If we use nitric acid alone (in any practical proportion) we get di-nitro-glycerine instead of the tri-nitrate. So, to take up the water that is being formed, and thus keep the nitric acid near to its original strength, a large amount of strong sulphuric acid is mixed with it. Sulphuric acid has a great affinity for water, while it is accommodating enough not to act on the glycerine or on the nitro-glycerine that is formed.

You are now in a position to understand the direction to which three-fourths of the efforts toward improvement in the nitro-glycerine business have been made. It has been an incessant struggle to obtain the strongest possible acids. The stronger the acids the larger the yield of nitro-glycerine, and therefore the cheaper the cost of production.

There are four companies manufacturing dynamite upon the Pacific Coast: The California Powder Works at Hercules, the Giant Powder Co. at Giant, the California Vigorit Powder Co. at Pt. Isabel, and the Judson Dynamite & Powder Co., also at Pt. Isabel. All are in Contra Costa county, California. The Giant Powder Co. also has works near Victoria, B. C., and the California Powder Co. has works for making black and smokeless powder near Santa Cruz, Cal. In 1903 the California, California Vigorit, and Judson companies were absorbed by the E. I. du Pont de Nemours Powder Co. (the powder trust), which took in every dynamite establishment in the United States except the Giant and Aetna. The Judson works used to be situated at Nobel, in Alameda county, but after the explosion there in the summer of 1905, the 'trust' consolidated the Judson with the Vigorit plant, which was only one mile away.

The manufacture of dynamite in California is a big business. During 1905, 31,090 tons of Chile saltpetre (sodium nitrate) were entered at the port of San Francisco, nearly all of which was used in the dynamite business. Thirty thousand tons would make nitric acid and dope for 22,900 tons of 40% dynamite or 1908 carloads of 24,000 lb. each. This means that the production of dynamite on the Pacific Coast during 1905 averaged not far from 3,800,000 lb. per month. Although, as a civil and mining engineer, I had seen dynamite used in pretty large quantities, yet as carload after carload used to go out from our own and the neighboring works, I never could cease wondering how the miners and contractors could really make use of it all. Between three and four million pounds of the yellow meal are made here every month, with grinding, and boiling, and choking fumes; all mixed, and sifted, and rammed into five or six million little packages by deft hands! Nearly three thousand 50-lb. cases start each day on their journey to strange places, and still the orders arrive as regularly as the daylight for more, more!

The Judson company buys its acids from the San Francisco Chemical Co. (now owned by the Mountain Copper Co.) which is near-by at Fleming's Point, West Berkeley. The Vigorit company obtains its sulphuric acid from the Stauffer Chemical Co.'s plant in the neigboring town of Stege, and makes its own nitric acid. Formerly it used to buy its nitric acid also, but the incessant struggle for stronger acid put too severe a strain upon the telephone wire and the Vigorit company erected its own nitric acid works, the chemical company gladly acquiescing. The California works make their own acids as did formerly the Giant; but the latter is now obtaining its acids from the Peyton Chemical Works, near Martinez.

Sulphuric acid is made by burning sulphur and blowing the sulphurous gases, together with air and steam, into one or more large leaden chambers, about 20 by 20 by 100 ft. in dimensions. A little nitric acid is also used and becomes decomposed into oxides of nitrogen. These take up oxygen from the air that is present and pass it on to the sulphurous acid gas, which thereby becomes oxidized to sulphuric acid. The oxides of nitrogen are unchanged in the process and are mostly recovered for use over again. The sulphur burned in the furnaces is in the form of iron pyrites, containing generally 46 to 50% sulphur, as it costs in that form only a fraction as much as imported Japanese sulphur, which was the material used ten years ago. Low-grade copper ore (1.5 to 3%) is generally used, and the copper is afterward extracted by leaching (as at the Stauffer Chemical Co.) or by smelting, as at the smelters of the Selby and Mountain Copper companies, and at the Peyton chemical works.

The sulphuric acid collects in the bottom of the lead chambers and is then of a strength known as 'chamber acid,' containing about 60% acid and 40% water (sp. gr. about 1.5 = 48° Beaumé). As sulphuric acid of a greater strength, when hot, will attack lead, the last two pans in which it is boiled are made of heavy cast iron. Diluted sulphuric acid will dissolve iron, but strong sulphuric attacks it only very slowly—the stronger the slower. The

acid thus made is shipped in iron tank-cars to the powder works. It has a strength of 93 to 94%. Five or six years ago some of the works used it directly for making their nitric acid and nitro-glycerine, but it gave too low a yield and there was "no money in the business."

All the dynamite works, whether they make their own sulphuric acid or not, have plants for concentrating the 'waste' sulphuric acid that has been used once in making nitro-glycerine. Such a plant is called a 'recovery' and is exactly similar to the one I have just described for boiling down the 'chamber acid.' When the Judson and Vigorit companies found that the chemical works would not supply them with acid strong enough for the dynamite business they resorted to the expedient of boiling the acid they received a second time in their 'recoveries.' At first they were able to increase the strength only about 2%, but in the last couple of years they have been able to do better than that. This second boiling of the acid (and the same thing applies, of course, to the recovery of the waste acid) is a mean business. Strong sulphuric acid decomposes at about its boiling point, so that in the finishing pans much of it is decomposed and driven off with the water. The last iron pan is covered over and the fumes are conveyed to large lead condensing pipes, cooled by water. The condensation of acid and water is run back in a stream into the lead pans, in order to save as much as possible. When the cover of an iron pan wears through, the building is filled with white acid fumes and the place looks like a London fog and breathes like a choice apartment in hades. Every few months one of the iron pans wears through and spills the acid into the red hot furnace, and there is so much acid in the air that the building and the furnaces do not last many years.

During the last three years a wonderful new method of making sulphuric acid has come into use and bids fair to solve some of the most difficult problems that the dynamite men have had to face. This is known as the 'contact' process, of which there are several patented varieties. It turns out the strongest sulphuric acid at one operation, without any boiling whatever. Sulphuric acid is a combination of water and a whitish gas, known as sulphur tri-oxide or sulphuric anhydride. By dissolving this gas in water in the right proportions, we can obtain an acid of 100% strength. Moreover, we can go farther and dissolve some more sulphur tri-oxide in the 100% acid and thus obtain what is known as fuming sulphuric acid. Sulphur tri-oxide and fuming sulphuric acid used to be made before the advent of the contact process by distilling ferrous sulphate, and they have been in use for over a century; but thus made they were never cheap enough for the powder manufacturers. Sulphur tri-oxide can also be made by passing the gas from burning sulphur mixed with air over platinum 'black' (precipitated platinum), and this reaction has been developed into the present 'contact' process.

The contact process was first worked on a commercial scale at the great Badische Anilin und Soda Fabrik at Ludwigshaven on the Rhine, where large quantities of fuming sulphuric acid were necessary in the manufacture of aniline colors. The first plant on the Pacific Coast for the manufacture of sulphuric acid by a contact process was erected by the Peytons, near Martinez, in 1900. The Peytons had formerly been connected with the management of the California Powder Co.'s plant at Santa Cruz. They had rights to the Grillo-Schroeder process, which was invented in Germany and controlled in the United States by the New Jersey Zinc Company.

After numerous delays they succeeded in manufacturing a splendid quality of strong sulphuric acid that brought joy to the hearts of the powder men. Unfortunately, however, it did not bring corresponding profit to the treasury of the Peyton Chemical Co. The trouble was that iron pyrite, as every miner knows, is very apt to contain small quantities of arsenical pyrite; and arsenic in the sulphurous gases, in any form whatsoever, will in the course of a few weeks make the platinum contact 'sick,' so that it will no longer act vigorously as a catalytic agent. The Badische works got around this difficulty only by a secret and very complicated process of purifying the gases, using much expensive machinery, and the technique of a wonderfully able staff of chemists. For some years the Peyton Chemical Co. was not able to fulfill the extensive contracts it had made and the Peytons spent hundreds of thousands of dollars more than they had anticipated before they succeeded in making their process practicable. For the last two years, however, they have been supplying all the mixed acids (nitric and sulphuric) used by the Giant Powder works.

In 1903, when I found that there was little hope of obtaining contact acid for the Vigorit works from the Peytons, I sent an agent to investigate the different contact processes in use in Europe and finally obtained the right to use the process of the Verein Chemischer Fabriken, at Mannheim. In the Mannheim process the air and gases from the pyrites furnaces, thoroughly dried, are first passed over iron oxide, ordinary pyrites cinders from the furnaces serving the purpose. By this step about 60% of the sulphur di-oxide is converted into sulphur tri-oxide, and, what is most important, the iron oxides combine with any arsenic in the gases. The gases thus purified are then passed over a platinum contact, where most of the remaining sulphur di-oxide (up to 95%) is converted into tri-oxide, and the latter then goes into the absorbing towers. As in the other contact processes, these are filled with sulphuric acid, which dissolves the sulphur tri-oxide better than water; and the acid is kept diluted with a stream of water sufficient in quantity to combine with the anhydride to form the grade of sulphuric acid that is desired. In August, 1903, the California Vigorit Powder Co. sold out to the 'trust' and I retired from the 'blow-up' business, so that the contact plant I had planned was never erected. But the Mannheim process has since been put into use by the Pacific Coast Oil Co., at Point Richmond, where immense quantities of strong acid are consumed in the refining of petroleum, and has been a great success. The California Powder Works is now completing a plant at Hercules to manufacture acid by the same process, and will doubtless supply both the California and Vigorit-Judson works. The Mannheim process has been used by the Nobel dynamite works in Great Britain since 1903, and several plants have recently been built in the eastern United States. The sulphuric acid yielded by the contact process has been the means of considerably increasing the yield of nitro-glycerine, of which I shall make further mention.

(TO BE CONTINUED.)

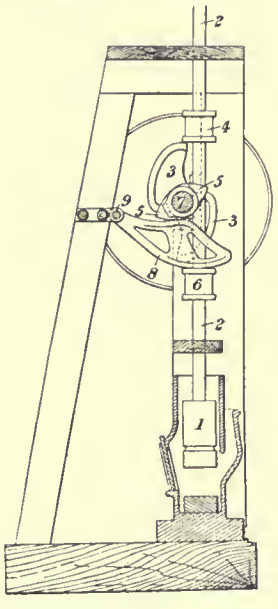
THE volcanic peak of Aconcagua, in Chile, is 23,000 ft. high, and Cotopaxi, in Peru, is 19,660 ft. high. These cones are situated on a high plateau, and therefore their height is not due to volcanic eruptions alone. But the elevations of Mauna Loa, in Hawaii, 14,000 ft., and Mt. Etna, 11,000 ft. high, are due entirely to this cause; while Mt. Shasta, in California, 14,100 ft., and Ranier, in Washington, 14,111 ft., are almost entirely due to volcanic action.

CONSIDERING the Mississippi as an average river in erosive power, the rate of continental erosion is about one foot in 5,000 years. At this rate, to remove an average thickness of 6,000 ft. would require 30,000,000 years.

MINING AND METALLURGICAL PATENTS.

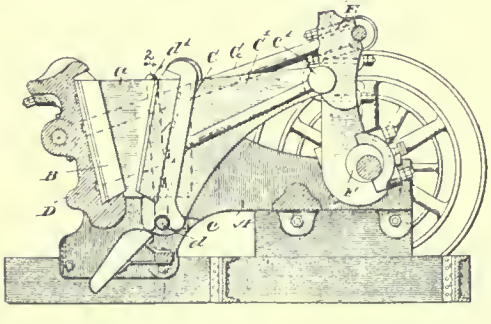
Specially reported for the MINING AND SCIENTIFIC PRESS.

DOUBLE-ACTING STAMP.—No. 844,847; George W. Beynon, Mortimer, and Gardiner H. Mackillop, Maidenhead, England; said Beynon assignor to Gustave Richard Bonnard, London, England.



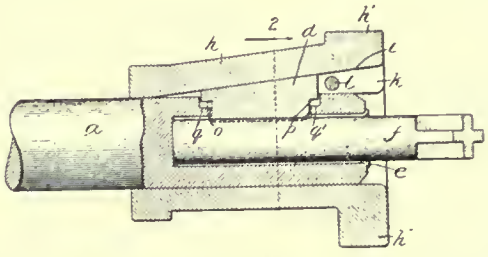
In double-acting stamp-machines and the like, a stamp-head, a stem carrying the same, and two tappets arranged on said stem, in combination with a pair of lifting-cams and a pair of downward-impulse-giving cams carried by one shaft, the lifting-cams being adapted to act on one tappet, and the downward-impulse-giving cams being adapted to give, through the other tappet, and adapted to act, in combination with an intervening lever, upon the other tappet, to give a downward impulse at each descent of the weight.

JAW-CRUSHER.—No. 845,028; Morton G. Bunnell, Chicago, Ill., assignor to Western Wheeled Scraper Co., Aurora, Illinois.



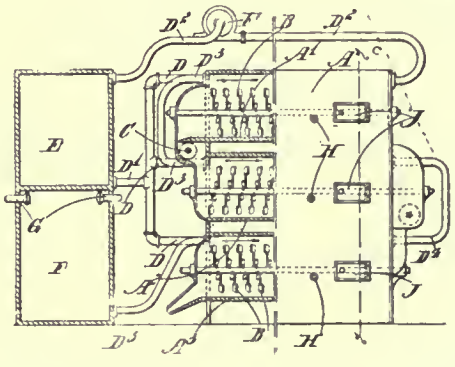
A crushing-machine comprising a suitable frame or body, a stirrup made or formed in one piece and hung inside the crusher frame or body, said stirrup being left free to be raised from the frame or body; a movable jaw provided on its under side with a transverse groove adapted to receive the lower transverse portion of said stirrup, the jaw in this way resting upon the stirrup and the latter supporting the jaw for forward-and-back or vibratory movement, and the jaw being left free to be raised from its swinging support, cheek-plates arranged at each side of the hopper of which said jaw forms a part, the vertical portions of said stirrup being arranged to swing or vibrate in recesses formed between said cheek-plates and said frame or body, the upper laterally projecting portions of said stirrup resting in grooves or concave seats formed on the upper surface of said frame or body, and a vertically reciprocating pitman adapted and arranged for actuating said jaw, the pivotal connection between the jaw and pitman being arranged at a point on a level, or substantially on a level, with the top of the jaw-face, and the power and motion thus communicated to said jaw causing the latter to move back and forth and permitting the resistance offered by the rock to hold the jaw down in place and thereby prevent it from rising from the stirrup upon which it rests.

DRILL-CHUCK.—No. 844,631; Robert Temple, Denver, Colorado.



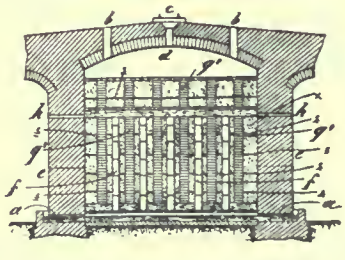
A drill-chuck comprising a socket member provided with a longitudinal bore for receiving the tool, a sliding collar mounted on the socket member, said collar being provided at one end with an outwardly extending circumferential flange, and means engaged by the collar and the tool to secure the tool in operative position, the flanged end of the collar extending beyond the tool-receiving end of the socket member.

PROCESS OF TREATING REFRACTORY ORES.—No. 841,657; Leslie V. Atkinson, Carshalton, England.



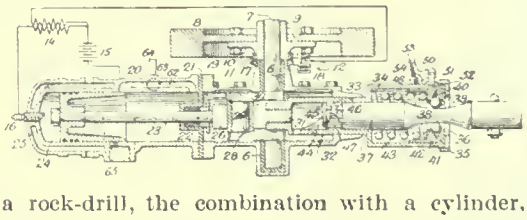
A process for the treatment of refractory sulphide ores consisting in roasting the ore, returning the gases given off by it into the furnace and alternating the admission of such gases into the furnace with air, and spraying weak acid upon the ore in the furnace.

ROASTING OF PYRITOUS MINERALS.—No. 840,253; Giovanni Rambaldini, Miniera di Boccheggiano, Italy.



The herein-described process for treating minerals which consists in effectually crushing the materials for treatment, limiting the maximum size between 10 and 15 millimetres, obtaining the greatest possible quantity of granular material, roasting the same and separating the granular portion.

HYDROCARBON ROCK-DRILL.—No. 842,246; John V. Rice, Jr., Bordentown, New Jersey.

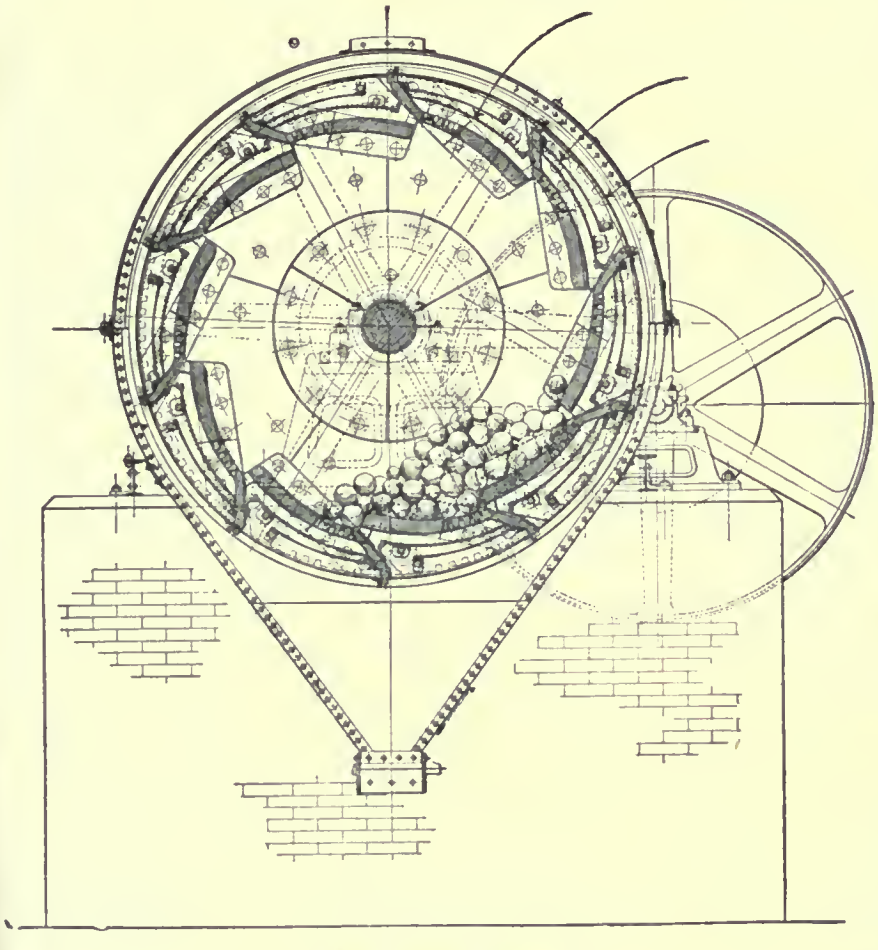


In a rock-drill, the combination with a cylinder, of a piston in said cylinder, a piston-rod, a fly-wheel, means actuated by said piston-rod for actuating said fly-wheel, a tube carried by said rod, a yoke at the forward end of the piston rod, a drill-carrier yieldably mounted in said tube, crank-arms with cross-pin playing in the yoke and a fly-wheel.

The Allis-Chalmers Ball-Mill.

In this machine, the driving-hub or spider at the feed end is made of steel casting, with three blade-shaped arms set diagonally so as to assist in throwing into the mill materials fed through the spider. This spider has three ample feed-openings and is securely keyed to the main driving-shaft, and bolted to the side plate by counter-sunk head-bolts passing through ring-plate and spider.

The driving-hub opposite to the feed end is made of cast iron, properly bored to fit the shaft and securely keyed thereto. The wear incidental to the grinding is to be taken on special steel plates made for the purpose of withstanding this particular use. The holes for the perforated section are cored so that the drilling of small holes is avoided, permitting the use of a harder plate. Wearing plates are three inches thick at the point of greatest wear. They are planed and drilled to template so as to make all repairs for these mills interchangeable. Each breast-plate is made in two portions, one constituting a perforated and the other a solid section, thus enabling the operator to replace one section when worn out instead of replacing the entire plate when only one section is worn out.



The Allis-Chalmers Ball-Mill.

Each Allis-Chalmers ball-mill is provided with a Gates automatic feeder, adjustable so that the quantity of material fed may be varied through a range of from zero to 50% above the rated capacity of the mill. The adjustment of the feeder is so arranged that it can be accomplished without stopping the mill.

An engineer of the Allis-Chalmers Co., who was for some years employed in Australia, gives the following interesting facts regarding the use of ball-mills (with forged steel balls) at one of the leading reduction works in the Kalgoorlie district, where the economies effected by this method of fine grinding have been particularly noteworthy.

The process there began, as a rule, with the breaking of the ore in a Gates gyratory crusher, but it was found that the ball-mills gave excellent results when fed directly with ore 3% of which, by weight, would not pass a 6-in. ring, and 75% of which would not pass a 2-in. ring. The mills with feed of even this character were capable of furnishing 33 tons of product, each, per 24 hr., such as would pass a 20-mesh screen. A mesh determination on the finished product of the ball-mills gave the following results:

	Per cent.
That retained on 40 mesh	24.1
That passing through 40 mesh and retained on 60	9.4
" " " 60 " " " " 80	6.2
" " " 80 " " " " 100	6.6
" " " 100 " " " " 150	3.2
" " " 150 " " " " 200	4.2
" " " 200 "	46.3

It will be observed that nearly half of the material was reduced to a state of division finer than 200 mesh.

One steel ball weighing 18 lb. added daily (24 hr.) to each mill preserves the balance of steel in the mills, while the grinding-plates and side-liners are replaced in complete sets every 7 or 8 months at a cost of less than $900. Each mill revolves at 25 r.p.m. and requires 24 i.h.p. The aggregate weight of the steel balls in each mill varies from one ton to 22 cwt. Of course, even better results are obtained when the ball-mills are working on the product of the Gates crusher, and that is the most economical method; but the above test is cited to show what mills equipped with forged steel balls are capable of doing alone.

The ore crushed at the plant mentioned is calcareous and silicious. A number of analyses of it have averaged as follows:

	Per cent.
Silica	40 to 50
Alumina	13 " 16
Ferric sulphide	6 " 10
Ferric oxide	7 " 10
Carbonate of lime	15 " 20
Magnesia	4 " 7

Traces of copper, lead, zinc, and arsenic are present. This ore carries no free gold, the precious metals present being in the form of tellurides.

That these mills have not found more ready acceptance by the operators of metallurgical plants is probably due to the fact that some difficulty has been encountered in obtaining balls that can be relied upon to wear evenly. The chilled-iron or cast-steel balls do not possess this quality and, as a result, the effectiveness of mills using them has been considerably reduced after the balls have begun to lose their shape. With the forged-steel ball, however, this defect has been overcome, and there can be no doubt but that their introduction has opened up many new fields of usefulness for ball-mills.

Commercial Paragraphs.

THE MIDVALE STEEL CO., of Philadelphia, Pa., announces that they have opened a branch office in the City of Mexico. Mr. John E. Strachan, who formerly was in charge of the Denver office, will be manager of the City of Mexico office. The head office for the Pacific Coast, for The Midvale Steel Co., is located in San Francisco, Mr. Jas. C. H. Ferguson being sales agent.

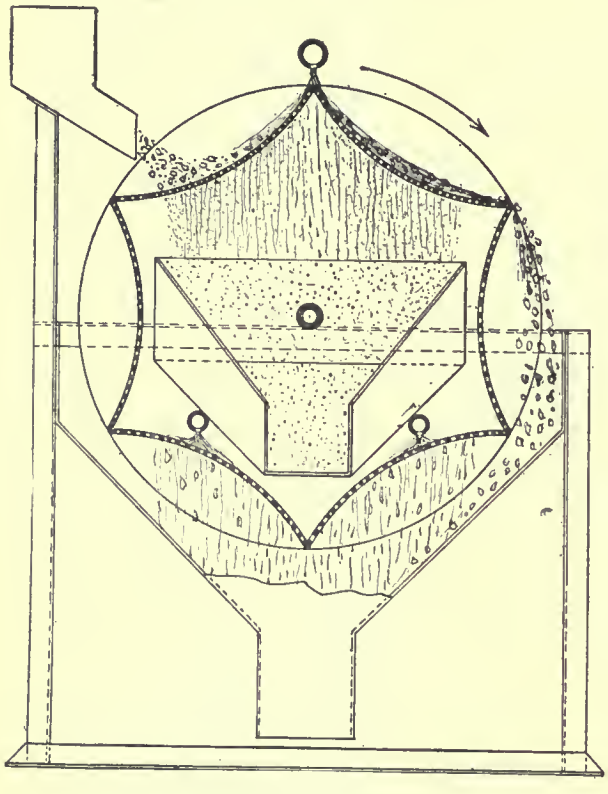
THE HENRY TROEMNER CO., of Philadelphia, recently shipped a 5,000-oz. bullion balance for the use of the Assistant Treasurer of the United States at San Francisco. This balance when loaded with its full capacity shows a sensibility of 0.01 of an ounce and is a counterpart of eight balances which were furnished a short time ago to the U. S. Mint at Denver by the same manufacturers. Among the recent shipments by the same firm was a 10,000-oz. balance to the mint at North Tientsin, China.

The King Revolving Screen.

Mr. H. G. King, the inventor of this machine, furnishes the following description of the screen and the mode of operation and is authority for all statements it contains:

The King screen is a revolving one with a hexagonal cross-section, the sides being curved inwardly toward the centre on a radius equal to that of a circumscribed circle, forming with its proper hoppers and outlet spouts a self-contained machine of the smallest dimensions, highest efficiency, and largest capacity that has heretofore been attained in any type of screen.

Referring to the accompanying diagram, it will be seen that, instead of being fed from the inside and screened outwardly, the King screen receives its feed from the outside, the fine finding its way to a stationary discharge hopper inside of the screen. Water is fed to the machine through a perforated pipe directly over the top of the machine. A parallel branch of the same pipe forms the stationary shaft on which the screen revolves, at the same time supplying an ample spray of water on the inside of the screen, effectually preventing all blinding of the meshes. The screened



The King Revolving Screen.

product is received in independent hoppers, which may be made to spout in any direction desired.

In first cost there is a saving when compared with other screens of equal capacity. This results from the extreme simplicity of construction and the adoption of easily replaceable wearing plates on all exposed surfaces. The wear of screen-cloth, one of the most irritating factors of increased milling cost, is reduced to a minimum.

The trifling wear of the screen-cloth was a genuine surprise both to the inventor and the manager of the mill in which the screen was first installed. It was found that the cloth seemed as good as new after 5,000 tons of ore were run over it during six months. This, however, is readily understood, when comparison is made with other types of screens. On the shaking screen the ore is carried forward by jerks, and hits every wire with oft-repeated blows, and in revolving screens the ore is carried up on the side until overcome by its own gravity it slides down to the bottom of the screen, only to immediately begin again the same constant grinding on all the wires exposed. When the ore falls upon the King screen its motion is practically stopped and the abrasive action very slight.

A constant trouble with all other screens has been the wear upon that part of the cloth that receives the feed. This small portion of the total surface is always exposed to the dropping of all ore handled, and the life of the screen is short. This trouble is entirely eliminated in the King screen, as every square inch of its surface shares alike in resisting this wear caused by the falling ore.

A greater efficiency and capacity is attained than with any other known screening device. The effective screening area of the King screen amounts to 33⅓% of the total area of the screen, whereas the effective screening area of the ordinary trommel seldom, if ever, exceeds 16 to 18% of the total area.

No slime is made on the King screen, while all revolving screens that are fed inside are veritable tube-mills, producing a large proportion of slime, and the shaking screens are the worst slime-makers of all. It is only necessary to add that with the gentle motion of the King screen there is none of the violent friction and abrasion that takes place between the particles of ore in other screens, and especially those of the shaking or vibrating type.

The King screen always keeps its meshes open, the inside spray accomplishing this more effectually than the old-style knockers of the trommel screens, which by the blows and the reactions wedge particles of ore still more tightly in blinded meshes just as often as they free them. The easy, gentle motion of the King screen, the absence of jars, and the action of the internal sprays prevent blinding and present a screening surface constantly open and ready for business.

This machine is almost self-operating on the principles of an overshot water-wheel, and after once starting, requires only the small fraction of a horse-power, which is more, in fact, for regulating the speed than for driving. A one-inch belt is used, no bevel gears, right-angle drives or extra counter-shafts being required.

As a concrete example, we may give the following comparison between the costs of screening in cents per ton, the first column showing the performance of an ordinary trommel screen and the last that of the King screen, both screens handling the same kind of ore through the same size meshes:

	Ordinary Trom. Screen. Cts. per ton.	King Screen. Cts. per ton.
First cost	0.20	0.12
Labor changing cloth	0.11	0.03
Screen cloth	0.14	0.05
Power	0.13	0.01
Lubrication	0.02	0.01
Attendance	0.40	0.25
Total	1.00	0.47

The King screen thus effects a saving of over 50%.

The Hendrie & Bolthoff Manufacturing & Supply Company are sole agents and are in a position to supply all orders at once. They will gladly show the King revolving ore screen to any mine or mill man who will call on them, or to any one who will send them his name and address they will send their new King screen catalogue.

Trade Treatises.

HENDRYX ELECTRO-CYANIDE CO., of Denver, issue Catalogue No. 3, describing the Hendryx process, and the machinery required for that purpose.

INGERSOLL-RAND CO., of New York, publish Form 46, being a descriptive catalogue of the Rand rock-drills. It contains a number of handsome illustrations.

THE BLAISDELL CO., of Los Angeles, publish Catalogue F, describing the automatic cyaniding machinery, in the manufacture of which this company has won a deserved reputation.

POWER & MINING MACHINERY CO., of Milwaukee, issue a handsome pamphlet on cement-making machinery, in the form of Catalogue No. 7. The enormous growth in the manufacture and use of cement makes this publication valuable to engineers.

JOHN A. ROEBLING'S SONS & CO. have re-printed an article from the *New York Herald* describing the model city of Kinkora, which has been built by them for their employees, ten miles below Trenton, N. J. It is an excellent example of enlightened business management.

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Editorial.

AMONG our market quotations we now give the average daily prices of copper, lead, spelter, and silver at New York. Those who are buying or selling ore will find these quotations reliable, and we expect that in due course of time they will use them in making settlements.

A KENTUCKY COLONEL once remarked that water would rot a sponge; the watering of stock is a form of financial irrigation in which E. H. Harriman appears to be peculiarly proficient. It is said that the electrification of the Chicago & Alton is impossible because of the certainty of a short circuit; at all events, in trying to explain the overcapitalization of that railroad, he got into deep water.

GREENWATER may have no profitable mines, as yet, but it has a well-printed clever little paper named *The Death Valley Chuck-Walla.* It is owned by its editors and therefore is possessed of an independence of spirit that we admire, even though it has found cause for objecting to a few of our remarks on Greenwater, and expresses that objection vigorously in the issue just to hand. We hope our contemporary may strike it rich—not green stains of copper, but solid sulphide ore running 25 per cent, at least.

POLITICAL CONDITIONS in the Transvaal affect the future of the mining industry, because the importation of Chinese is a debated question. The grant of popular government has resulted in the election of a majority of Het Volk, this being the Boer party, which is opposed to Chinese labor. It is a striking proof of the generosity of Great Britain that the ministerial front bench in the new Parliament will be filled by the generals of the late Boer army. Thus, within six years after the war, the vanquished are again in the saddle, as leaders of a scheme of government granted by the victors. It remains to be seen whether in this case generosity is allied to good sense. The spectacle does honor to the race.

THE POSTHUMOUS notes on silver-lead smelting by T. S. Austin are of great interest. It is a melancholy fact that while he lived, he was not permitted to contribute to metallurgical literature, because the persons by whom he was employed held the opinion that secrecy as to the practice at their smelters was necessary. Such narrow notions still prevail at some smelting establishments and retard the progress of technical science. On the whole, the secretive people are the chief losers, for it is certain that there is no better way of getting information than of giving some yourself, to encourage the others. We are aware that among the larger corporations, in control of a number of reduction works, it is the custom to distribute the data obtained at their various plants among their managers, encouraging them to

compare results. But as the operations are under the direction of a small group of men of similar ideas, there is nothing like the ventilation of the subject or the interchange of ideas that would come from publication in periodicals that are read by independent men on the outside.

Black Sands Again.

We are in receipt of the report on the investigation into the 'black sands' of the Pacific Coast, as published by the Geological Survey and prepared by Dr. David T. Day. It has been demonstrated that such material in its natural state contains from nothing to a few cents per ton in gold, and that if concentrated it will assay many dollars, according to the degree of concentration. Some fragmentary experiments in steel-making were made. A few makers of machinery have been advertised, and several promoters have secured ammunition for pernicious schemes, based on alluvial deposits of questionable value. The general fact of the loss of gold, and possibly platinum, in placer mining has been known for thirty or forty years, but a method of turning that loss into profit in a practical fashion has not been vouchsafed by this report or any other like it. The occurrence of rare earths in the sea-beaches is as well known as it is that gold exists in the water of the ocean; the learned Doctor only worries practical people by his academic effort to emphasize the amount of it. For instance, we received a letter from the owner of a hydraulic mine, informing us that a cubic yard of gravel had been tested by Dr. Day and that it had been demonstrated that there was more than twice as much gold in it as the average yield of the mine. Any young graduate from a school of mines will tell this investigator that one sample will not give the general average of the ore of a whole mine. In the same way, a yard of gravel is taken, the heavy particles are concentrated, and the result is a rich product, which is quoted at so many dollars per ton of concentrate, when it ought to be stated in terms of cents per ton of the crude stuff. In many of the cases quoted in the report, it is noted: "Concentration not known." Then the sample is worthless, except to incite fraudulent enterprises and to excite exaggerated hopes. Any tyro knows that in the gravel of any gulch there can be found all sorts of beautitul things, from shot that was aimed at rabbits to gold rings that missed their destiny. To tell the working miner that his gravel contains gems, platiniridium, josephenite, and tantalite, is magnificent, but it is not ecouomic geology. Even quartz sand, we are informed, is valuable, and garnets have their use as abrasive material. So they have; charcoal is identical chemically with the diamond, and the pearl is but a blister. The whole affair is out of proportion. What the miner and the public generally want to know is how to improve the present methods of extraction so as to minimize the losses in gravel mining. In that direction nothing has been done by Dr. Day that is worth recording. "The Doctor threw up his hands and quit," so one old digger of our acquaintance declares, "right when he should have put on his boots, and McCluskey took the night shift."

Geological Survey for Colorado.

We have been favored with a copy of the bill for creating a State Geological Survey in Colorado, together with another bill dealing with the appropriation for such a department. The main provisions are that the State Geologist shall be the head professor of geology in the State University, his assistants are preferably to be teachers of geology in the State educational institutions, the offices of the Survey shall be at the University, the salary of the State Geologist is to be $500 per annum as executive, plus $8 per diem when doing field work, but the entire sum to be appropriated for the purpose of paying the Geologist, his assistants, their traveling expenses, and other expenditure incidental to the work, is to be $5,000. Finally, the advisory board is to consist of the Governor and the presidents respectively of the University, School of Mines, and Agricultural College of the State.

This is a truly pitiable outcome of the effort to establish a Geological Survey in Colorado. From our own acquaintance, extending over twenty years, of affairs in Colorado, we do not hesitate to say that the advisory board is ill chosen. A Governor rarely knows anything about geology or the application of it, but there are obvious reasons why he must be chairman of such a board; to that we cannot object. The president of the School of Mines is eminently fitted to advise, but what about the presidents of the other two State institutions? Presidents are fussy people at the best, and a board composed of three of them would be a dignified futility. However, even that feature is not so important. There is the provision that the State Geologist is to be the professor in the State University. Some professors are eminently fitted for directing geological investigations, some are not; in fact, a good teacher is rarely an effective executive.

The State University is at Boulder, and the office of the Geological Survey must be there also—a manifest inconvenience. Denver is the place for it. Next, although not conditioned, it is suggested that the assistants are to be teachers from the State institutions. Here we see trouble for the Geologist, who naturally may want men less academic to help him in his practical work. These provisious seem provincial, and a little humiliating to our notion of a useful geological department, which ought to be assisted by men that have knowledge of the exploitation of ore deposits and the actual search for them. Finally, we come to the appropriation, of which we do not hesitate to say that it is a disgrace to Colorado. Five thousand dollars per annum all told for a Geological Survey of Colorado! The thing is ridiculous. A State that produces fifty million dollars worth of metals and minerals every year is to devote $5,000 for a scientific iuvestigation and recording of its geological features. If that is the best that Colorado can do for its mining industry, it is time to acknowledge that the value of science is unknown in that great mineral region, and that its people are so dense to their own interests that they will not encourage the applicatiou of geology to their basic industry.

Mexican Mine Labor.

On another page we publish some sensible observations on mine labor in Mexico, by a writer who is familiar with practical work in the Southern Republic. It is an interesting subject and is particularly important at this time, when the labor supply in so many mining regions is acknowledged to be deficient. On the whole, we consider the employment of native workmen more economical than foreign labor in Mexico. And this holds good in other countries; it is usually best to make the most of the material at hand. The Negro in the mines of the South, the Korean at the Oriental Consolidated mines, the Kaffir in the Transvaal, are examples of the utilization of an indigenous labor supply. Of course, the Mexican is a poor hammersman, and rarely uses his pick as he ought to; but he can be taught; a little patience and a good foreman can do a great deal to improve his methods. It is well recognized that they are excellent blacksmiths, though better at shaping than at tempering the drills. They are small men, and as a rule have the physique of an American boy, rather than that of a well-grown man; but they are strong in unexpected ways, and are capable of being made most efficient miners. To this task the superintendents of foreign companies ought to set themselves, for the time is coming when a scarcity of white labor and a rise in the price of the native supply will create a problem, the solution of which lies close at hand, in the training of the native to greater efficiency. Nearly a hundred years ago Englishmen began to exploit mines in Mexico, and with their machinery and more advanced methods, they also introduced their own workmen. It was a costly blunder, on the whole. Both the European and the American tends "to go to pieces" in the tropics and among colored races; the cheapness of various intoxicants, the laxity of morals, the lessening of self-respect far from home, provoke dissipation of many kinds and injure the sturdy manhood that gives dominance to the white race. Finding himself among a servile population, the white workman begins to depend upon helpers, until a mechanic must have a *peon* to hand a monkey-wrench to him, and, in fact, he will do nothing that a native can do for him. The white man loses his temper and becomes a dull instrument of industry. This was the lesson of the English experience of three generations ago, and it is the experience of the American companies today. To balance it, the training of the native is the only remedy. And in the doing of this there should be no narrow spirit. A manager will say to himself: What is the use of teaching my Mexican employees, when they will leave me as soon as they have been taught and go to some other fellow's mine? Then, let the "other fellow" also improve the methods of his men until there is a plentiful supply of the right kind. There is now so much Anglo-American capital in Mexican mining enterprises, that it is worth while to attack this problem in a proper spirit, so that the condition of affairs that is crippling operations on the Rand may not be duplicated, for example, at El Oro, Pachuca, Guanajuato, Zacatecas, or Chihuahua.

The Canadian Mining Institute.

The annual convention of the Canadian Mining Institute was held at Toronto last week at the King Edward hotel, commencing on March 6. About 150 members were in attendance including many mining men and geologists of continental reputation. George R. Smith, the president of Thetford mines, Quebec, occupied the chair.

In his address the president enlarged upon the rapid development and growing importance of the mining industry, quoting statistics to illustrate its marvelous expansion, especially in Ontario, and expressed the hope that smelters would soon be established in Canada to obviate the necessity of shipping ore abroad for treatment. He also hoped that Quebec would before long have railroad facilities extending to its mineral belt in the north.

A report of the mining section of the Geological Survey of Canada, showing the mineral production of the Dominion for 1906 was presented, from which it appears that the total production (including $300,000 estimated value of products not returned) was $80,000,048, as compared with $69,525,170 for 1905. The metallic production of 1906 was $42,979,629, made up as follows: Copper, 57,029,231 lb., $10,994,095; gold, Yukon, $5,600,000, all other gold, $6,423,932; iron ore exports, 77,778 tons, $149,177; pig iron from Canadian ore, 101,660 tons, $1,724,400; lead, 54,200,000 lb., $3,066,094; nickel, 21,490,955 lb., $8,948,834; silver, 8,568,665 oz., $5,723,097; cobalt, zinc, and other metallic products, $350,000. Increases are shown in nearly every item, the only important exceptions being gold and petroleum. There were specially large increases in silver, nickel, copper, and portland cement. Ontario has assumed a first place in Canada in silver production, owing to the development of Cobalt. British Columbia, on the other hand, shows a slight decrease, owing to the falling off in the Slocan. The expansion in the value of the copper product amounted to nearly $3,500,000, or 47%. British Columbia and Ontario were the two main contributors, furnishing respectively about 79 and 18% of the total. Throughout the whole country the increase in prices has stimulated the search for new deposits and the re-opening of old mines. The production of nickel from Sudbury ores has made rapid growth during the past two years, the output for 1906 being over twice that of 1904. The following are the results of operations last year: Ore mined, 343,814 tons; ore smelted, 340,059 tons; matte produced, 20,364 tons; matte shipped, 20,310 tons; copper contents of matte shipped, 5,264 tons; nickel contents of matte shipped, 10,745 tons; spot value of matte shipped, $4,629,041. The total production of pig iron in 1906 from both Canadian and imported ore amounted to 548,141 tons, as compared with 525,306 tons in 1905. The total of iron ore produced in Canada last year was 269,511 tons. The coal output, which has increased steadily for 12 years, was 9,916,177 tons, value $19,945,032, an increase of 1,248,229 tons over 1905. Nova Scotia produced more than 60% of the total. The salient feature of this industry in 1906 was the great development in coal-mining in the West, more particularly Alberta. There are now six collieries in that Province, each having an annual production of over 100,000 tons. The total quantity of portland cement made in Canada was 2,152,562 bbl., as compared with 1,541,568 bbl. in 1905.

J. M. Clark, of Toronto, read a paper on 'Royalties on Minerals in Ontario,' prefacing it with the remark that although pertinent to the subject, it was written before the proposal to tax mines had been made by the present Government. The paper pointed out the disas-

trous results of such legislation in the past. Many years ago there was a considerable interest in the Hastings district in Eastern Ontario. This resulted in the imposition of royalty on gold, which gave a decided check to the growth of the industry. The royalty was abandoned and a statutory declaration introduced, declaring mining lands and ores free from every royalty tax or duty. Again, when interest became aroused in the mineral resources, royalties were re-imposed in 1891, but confined to land sold or granted after May 14, 1891. The result of this legislation was to make it practically impossible to interest foreign capital in exploration, and the royalties were in consequence repealed. The writer contended that in view of the statutory declaration still appearing on the statute book, proclaiming mining lands and minerals free from royalty, that to impose a tax on them would be a breach of faith toward investors. The fact that the characteristic ores of the Province were low-grade and requiring large amounts of capital for their development called for grave consideration of the problem and immense injury would result if the inflow of capital were seriously checked. The discussion which followed occupied the remainder of the session. The convention was practically unanimous in its opposition to the tax. A resolution was adopted to the effect that the bill was opposed not only to the mining interests, but to the manufacturing and agricultural interests of the Province, and asking the Government to take time to consider carefully what has been the effect of similar legislation in other countries. It was also resolved that the members of the Institute as a body wait on the Government and present the resolution. President Smith, J. E. Hardman, A. M. Hay, R. W. Leonard, and J. M. Clark, were selected as spokesmen of the delegation.

The members of the Institute then proceeded to the legislative buildings, where they were received by Mr. Frank Cochrane, Minister of Mines, and other members of the Government. After listening to the arguments advanced, Mr. Cochrane announced that it was the intention of the Government to proceed with the bill, which had been demanded by the press. He contended that the mining interests had had ample notice of the intention of the Government to impose a tax. The only modification that would probably be made would be the allowance of a rebate upon iron ore smelted in Canada.

In the evening J. C. Gwillim, of Kingston, Ontario, read a paper on 'The Status of the Mining Profession,' dealing with the evil of wild-catting. He suggested action by the Institute to prevent the publication of prospectuses containing statements not vouched for by some person of recognized standing, and restrictions on advertising. In the course of the discussion which followed, Eugene Coste said that the Government should not charter companies capitalized nominally for millions of dollars without having absolute assurance that they were bona fide.

Other papers read were by Eugene Coste, on 'The New Tilbury Oil Fields,' and by H. H. Stoek, of Scranton, Pa., on 'Anthracite Mining Methods in Pennsylvania.'

The next morning session was devoted to the Cobalt area, the first address being given by Willet G. Miller, Provincial Geologist of Ontario, entitled 'Notes on Some Additions to the Map of Cobalt.' He prefaced it with a retrospect of the early discoveries, and pointed out the position and characteristics of the various rock formations, indicating the possibilities of further discoveries. The ore already taken from an area of six square miles has made eight or ten millionaires and has given to 25 or 30 persons fortunes of between $25,000 and $300,000. So far about 100 veins have been discovered that are, or seem likely to become, productive; in Saxony, the similar formation had 300 producing veins.

C. R. Van Hise, president of the Madison University, Wisconsin, spoke on 'The Geology of the Cobalt District,' and at the outset expressed his high appreciation of the faithfulness, accuracy, and correctness of the work of the Canadian geologists. The Cobalt deposits illustrated the formation of ore deposits by more than one concentration. He was of the opinion, as regards most of the ore deposits in the United States, that there had been at least two periods of concentration—the first under deep-seated conditions resulting in the deposition of the arsenides, sulphides, etc., and a period of secondary concentration resulting from the circulation of surface waters. His observations at Cobalt confirmed this view. The cobalt minerals were the results of the earlier concentration; the silver minerals came in later and precipitated the silver. A noteworthy feature of the Cobalt deposits was the extraordinary variation in richness. This irregularity in distribution, illustrated by the finding of large silver nuggets, was the result of two concentrations. It was explained by veins having become shattered and the silver afterward deposited in solution. The finding of rich nuggets on or near the surface was attributable to the rocks of the upper strata having been worn down by erosion, scattering the silver. It was, however, a problem to what extent the lower horizon was the result of concentration under deep-seated conditions and whether secondary concentration had occurred there also. He believed that it had, but the question was not yet solved. The exceptional conditions at Cobalt were associated with the intrusive sheet of diabase, which was the source of the mineral. The diabase had intruded at a time when conditions were favorable for ore deposition, forming cracks and fissures in the older rocks, wherein the cobalt and silver minerals were precipitated. Under such conditions it was to be expected that the diabase would be found productive adjacent to the conglomerate and slate, which was just where the richest deposits were found. The precipitating agents were, he believed, in the conglomerates and Keewatin. If these conclusions were correct they had an important bearing on explorations, as deposits were most likely to be found within a reasonable distance of the diabase. But it was possible that ore deposits might occur in the conglomerate and Keewatin with no diabase, owing to the latter having been eroded. Kerr lake was the contact of the diabase and conglomerate. The horizon beneath the diabase was a legitimate field of exploration, but any ore deposits there would be the result of deep-seated concentration, unaffected by secondary effects. Prof. Miller said that as the veins passed from the conglomerate into the Keewatin, the silver died out, the veins continuing to yield cobalt and nickel. The solutions carrying the silver could work through the conglomerate, but not through the Keewatin.

In the afternoon the consideration of the question of mining taxation was resumed and a resolution was adopted declaring that while the mining industry had no objection to necessary taxation if equitably distributed and collected, provided vested rights were respected, it did object to a royalty tax, because it was confiscatory in its nature, impossible of collection except by an intolerable system of inquisition, and certain to prevent the investment of capital. It concluded by asking for the appointment of a commission to consider the bill.

In the evening there was a banquet at which Mortimer Clark, the Lieutenant-Governor of Ontario, presided. Among the speakers were Frank Cochrane, W. J. Hanna, A. M. Hay, James F. Kemp, and John E. Hardman.

Personal.

BEN. B. LAWRENCE is in Cuba.

WALTER P. JENNEY is visiting Salt Lake.

GILMOUR E. BROWN is at Iquique, in Chile.

R. W. RAYMOND is taking a holiday in Jamaica.

H. VINCENT WALLACE is at Guanajuato, Mexico.

JOHN C. MONTGOMERY has returned to New York.

R. M. BAGG, JR., is now residing at Colorado Springs.

THOMAS RICKARD has returned to London from Russia.

W. R. CROSBY, of Virginia City, is visiting San Francisco.

F. L. BOSQUI has gone to El Paso, Texas, on a short visit.

HENRY KRUMB has returned to New York from London.

GEORGE B. LEE is expected in San Francisco from New York.

LEO VON ROSENBERG has returned to New York from Arizona.

J. H. BELLASIS, lately in Rhodesia, is at Columbia, California.

ELLSWORTH DAGGETT has returned to Salt Lake from New York.

T. F. JAMES is visiting Kansas City from Cumpas, in Sonora, Mexico.

H. A. TITCOMB has returned to London from a visit to St. Petersburg.

MARK R. LAMB is on his way from Guanajuato, Mexico, to San Francisco.

S. W. MUDD is a director of the Mines Syndicate recently organized in New York.

FRANK H. PROBERT has finished his work at Butte and is expected at Los Angeles.

G. W. BORROWE is manager of the Gt. Boulder Perseverance mine at Kalgoorlie.

FRANK L. SLOCUM passed through San Francisco on his way from Chihuahua to Pittsburg.

R. HAY ANDERSON has returned to Mexico City from inspection work in Sonora and Sinaloa.

C. HOPE NICOLSON is now manager of the Lancefield mine, at Laverton, in Western Australia.

H. PENGELLY, formerly at the West End, is now foreman of the Montana-Tonopah mine, at Tonopah.

F. G. T. NICHOLAS has been appointed manager of the Melbourne office of Bewick, Moreing & Company.

DONALD F. CAMPBELL is visiting the goldfields of Nevada in the interest of the MINING AND SCIENTIFIC PRESS.

E. A. H. TAYS has returned from a journey to South Dakota and Montana. Next week he will be in Arizona.

JOHN MORGAN, formerly at the South Kalgurli, is now superintendent of the Oroya-Brownhill mine, at Kalgoorlie.

C. COLCOCK JONES has returned to Los Angeles from an extended professional trip through San Bernardino county, California.

J. C. RALSTON, who underwent a serious operation six months ago at Rochester, Minn., is convalescing at his home in Spokane.

F. KARL LAMB has accepted the position of cyanide superintendent with the Guanajuato Consolidated Co. at Guanajuato, Mexico.

WILLIAM W. PORTER, having severed his connection as a director and officer of the Guggenheim Exploration Co., and the Esperanza Mining Co., announces his association, as president, with the Mines Syndicate.

DAVID BLACK, for a number of years secretary to the Stearns-Roger Mfg. Co., Denver, has resigned, and is now purchasing agent for the Yuba Construction Co., Marysville, California.

ALFRED VON DER ROPP, the manager of the Selby smelter, and to whom the success of that establishment is mainly due, will take a leave of absence on April 1. It is likely that he will choose to make his absence indefinitely long.

Commercial Paragraphs.

JOHN F. MUNN, who has for several years been associated with the Davis-Calyx Drill Co., also with the Cincinnati Core Drilling Co., is now connected with the Cyclone Drill Co., of Orrville, Ohio. Mr. Munn has had a large experience with core-drills in various parts of the country.

THE CYCLONE DRILL CO., of Orrville, Ohio, recently shipped one of their combined core and hollow-rod drilling outfits to Wm. Gelder & Co., of New York, for prospecting their property at Tonopah, Nevada, and a duplicate outfit to O. W. Dunlap, Carlsbad, New Mexico, where a large mineral property is to be developed.

THE C. H. SHAW PNEUMATIC TOOL CO., of Denver, Colo., recently received an order from the Copper Queen Mining Co., at Bisbee, Arizona, for 50 Shaw Eclipse air-hammer rock-drills. This is the second order from the Copper Queen for drills within the past year. In June, 1906, they ordered 50 of these machines.

C. I. GLASSBROOK is local manager for the MINE & SMELTER SUPPLY CO., at 412 Market St., San Francisco. A stock of Wilfley tables is kept on hand for immediate shipment. This company now has branches at Salt Lake City, Utah; El Paso, Texas; City of Mexico; Denver, Colo.; with headquarters in New York at 42 Broadway.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco, March 14.

Argonaut	$4.70	Bunker Hill	$2.50
Con. Virginia	0.86	Savage	0.75
Mexican	0.77	Sierra Nevada	0.75
Ophir	2.50	Yellow Jacket	1.05
Belmont	5.25	Midway	1.90
Combination Fraction	4.25	Montana	3.45
Goldfield Con	8.25	Mohawk	17.50
Jim Butler	0.98	Red Top	4.25
Jumbo	4.25	Sandstorm	0.58
Jumping Jack	0.21	Silver Pick	1.26
Manhattan Con	0.65	Tonopah Ex	3.77

METAL PRICES.
By wire from New York.
Average daily price in cents per pound.

Date	Copper (Electrolytic)	Lead	Spelter	Silver
March 8	25⅛	6	6⅞	68½
" 9	25⅛	6	6⅞	68⅝
" 10	Sunday.	No market.		
" 11	25⅛	6	6⅞	68¼
" 12	25⅛	6	6⅞	69
" 13	25⅜	6	6⅞	68⅝

ANGLO-AMERICAN SHARES.
Cabled from London.

	March 7. £ s. d.	March 14. £ s. d.
Camp Bird	1 5 9	1 6 0
El Oro	1 8 6	1 9 6
Esperanza	2 5 9	2 4 6
Dolores	1 17 0	1 16 3
Oroville Dredging	0 19 6	0 19 0
Stratton's Independence	0 3 0	0 3 0
Tomboy	1 16 3	1 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices March 7.	March 14.
Bingham Central	1¾	1¾
Boston Copper	29	23
Calumet & Arizona	179	169
Cumberland Ely	10½	9
Dolores	9⅞	8⅞
El Rayo	5¼	5½
Guanajuato Con	4¼	4½
Giroux Con	9½	8
Greene Con	27½	24
Nevada Con	16⅞	13
Nipissing	12⅜	11⅞
Tennessee Copper	51	39½
Tonopah Ex	4½	3⅞
Tonopah-Belmont	5¼	4¾
Tonopah	17¾	16
United Copper	76⅞	66
Utah Copper	36	29

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Mining Summary.

ARIZONA.

COCHISE COUNTY.

It is understood that the directors of the Denn and Shattuck-Arizona companies have decided that a smelter will be built for the treatment of the ore from the mines of the companies.——The car famine is decreasing in Bisbee, and last week 100 cars of ore left there in one day. El Paso & Southwestern recently received 500 empty cars for this division, and it is learned that fuel is coming in with greater regularity.——A strike has been made in the Dunn Springs portion of the Paradise district.——The King of Lead property is the steadiest producer in Wood cañon. A shaft is down 250 ft., and a tunnel is 500 ft. long.

There have been no recent developments in connection with the proposed organization of the Western Federation of Miners in Bisbee. At their last meeting, the miners decided that the time had not yet arrived for the election of officers of the local lodge, and they are making no progress in enrolling new members. At the last meeting, 80% of those present were foreigners, and the Federation is apparently losing ground, and is no longer a serious factor in Bisbee affairs. The mining companies are determined not to recognize the organization, and, if necessary, will close all the properties in Bisbee.

PINAL COUNTY.

(Special Correspondence).—Developments in this district are proving satisfactory. Eastern capital has been investing in Pinal county mines, and the resulting prosperity of the district is noticeable. At the Two Queens group, where rich ore was discovered but a few months ago, the main adit has been run 278 ft., and will cut the vein in 34 ft. more. Shipping ore is showing in the shaft.——The Dan O'Carroll property, acquired a short time since by the Drippings Springs Copper Mines Co., and situated near the Saddle Mtn. smelter at Christmas, is being rapidly developed, and is proving valuable. At the Two Queens group of mines a hoisting plant has been installed at the main shaft, and is in operation. Shaft No. 3 is down 38 ft., and has encountered a vein averaging over three feet in thickness. From present appearances it would seem that the ore is likely to continue.

Winkelman, March 11.

CALIFORNIA.

AMADOR COUNTY.

Engineers have been sampling the Argonaut mine, and the new manager is expected to arrive at the property before long. A new shaft will probably be sunk on the Hoffman ground.—— R. L. Chase is the new superintendent of the Lucas mine, he having succeeded F. H. Hammond.

NEVADA COUNTY.

(Special Correspondence).—The Champion and Home mining suit, which has attracted so much attention has been settled and work will be resumed at once. The Champion has purchased the Home holdings, and both properties will be worked through the Champion shaft. The reopening of these mines means a great deal to Nevada City, as a large force of men will be employed. The Champion people will operate upon a larger scale than ever. This property is down 2,400 ft. on the incline, and was a continual producer for years, until 1904, when litigation started. Other valuable property nearby may be consolidated in the near future. Both the Home and Champion mines are well equipped with machinery. They are situated about three miles from Nevada City, upon Deer creek.——The Lincoln mine, one mile east of Nevada City, with a shaft down 80 ft., is looking well. A 16-in. vein has been uncovered, which assays $160 per ton. This mine was worked in former years to water-level, and some good ore was mined.——The famous Pittsburg mine, between Nevada City and Grass Valley, which has been idle for years, is to be opened. The 10-stamp mill is being repaired and a large force of men will be put to work.——The Mayflower mine, at Washington, 18 miles from Nevada City, which has been one of the best producers of that section, has opened a new body of ore and an extra force of men has been put to work. The mine has been well developed, and the company contemplates extensive improvements.——The Midnight mine, which is within the city limits of Nevada City, recently uncovered some of the richest ore ever found in the district. The vein is strong and well defined.——In the southern portion of Nevada county work is progressing on the copper properties, and if the present showings continue, the owners say that a smelter will be erected on the line of the proposed railroad between Nevada City and Marysville.——The Niagara mine, situated a few miles south from Nevada City, is making a splendid showing. The inclined shaft is 160 ft. deep and levels will soon be run. The pay-shoot is about 300 ft. long, and runs from $7 to $18 per ton, with occasional rich bunches.——One-third interest has been purchased in the Round Mtn. mine and an adit will be run.

Nevada City, March 12.

The shaft of the Montana mine will be re-timbered, new buildings will be erected, and new pumps installed. The mine, which has been named the California-Montana, is down 400 ft.——The Primrose mine, near Sierra City, will be worked again, and the 10-stamp mill on the property started.

SISKIYOU COUNTY.

The Oregon Water Power & G. M. Co. will put in a higher ditch to its property below Happy Camp, in order to get more pressure for the giants. The company owns 1,200 acres of mineral land.——The Riccoro Mining Co., operating at Classic hill, is running two giants, day and night.

SHASTA COUNTY.

A new strike has been made in French Gulch by the Bully Hill Co. The property was bonded a year ago from J. L. Cannon and C. C. Fox, and 1,000 ft. of tunneling has been done.

(Special Correspondence).— John C. Montgomery has purchased the Sheridan group of claims from Thomas J. Barbour. One-third of the stock in the new company was then sold to the Balaklala company, and one-sixth of the stock was placed in the treasury, Montgomery and Barbour retaining control. The following officers were elected: T. C. Barbour, president; John C. Montgomery, secretary and treasurer; and C. C. Dorsey, a director.

Redding, March 11.

TUOLUMNE COUNTY.

(Special Correspondence).—A rich strike was made a few days ago on the 1,100-ft. level of the App mine, at Quartz. The two-foot vein on the hanging wall shows free gold, and is reported to run $1,000. It is said that from $25,000 to $30,000 is being taken out daily. From present indications it is believed that this strike will prove to be one of the most valuable ever made in Tuolumne county. H. M. Pease was recently appointed superintendent of the App.—— The unwatering of the Davidson shaft of the Soulsby mine has at last been accomplished, after a year's continuous work. An air-compressor is being installed for operating the machine-drills. Active underground work will be resumed at this part of the mine. The Davidson and Pennsylvania shafts will be connected by a tunnel 500 ft. below surface. Several bodies of high-grade ore have been uncovered during the past year, and the company apparently is satisfied with the outlook. It is reported that the first payment on the purchase price was made recently.—— A 10-stamp mill has been ordered for the Imperial mine, near Jacksonville, and the site on which it will be built is being graded. Within a few days the shaft will have been unwatered, when sinking will be resumed.—— Cutting a station in the Santa Ysabel shaft at the depth of 200 ft. was commenced this week, and driving on this level will shortly be begun. The shaft has been unwatered to the 600-ft. level.——Since the recent discovery of a copper-bearing lode two miles southeast of Jamestown, several prospect shafts have been sunk on the property, and assays show from 7 to 20% copper, and a trace of gold.—— The mill at the Mt. Lily mine, near Columbia, has been started.—— Paul F. Green, owner of El Oro mine, situated south of Tuolumne, expects to have the two-stamp mill that is now being

erected on the property, in operation by May 1. A tramway several hundred feet long that will connect the main tunnel with the mill is being built. The main tunnel is 173 ft. long, and will be continued into the mountain. When it reaches a point in line with the shaft, 100 ft. from the present face of the adit, a raise will be run to tap the shaft. Ventilation of the mine will thus be accomplished. The vein is from 6 to 18 in. wide, and assays from $10 to $60 free gold.

Tuolumne, March 10.

NEVADA.

WHITE PINE COUNTY.

(Special Correspondence).—Ely is a well-built town with good hotels, electric lights, an excellent water supply and good railroad facilities, and is situated in the heart of the Robinson copper district in eastern Nevada. It is one of the oldest mining camps in the State and for several years has been actively prospected by the Guggenheim Exploration Co. for copper. While the copper deposits of this district are not as high-grade or as extensively developed as some of the reports sent out would indicate, some good copper properties are found here, and the future of the town seems assured.——The town has about six thousand inhabitants, and each train brings scores from all sections of the country. Several smelters are being built, but it is probable that, with the exception of the Steptoe smelter, which is being constructed by the smelter trust, not one will be in active operation for some time to come.——The principal properties have been acquired by the Guggenheim interests, although several good prospects are controlled by others. The copper deposits are of great extent, but are low-grade and until the smelter is in operation, development will be necessarily retarded. The Steptoe plant, when working at full capacity, will be able to handle 5,000 tons of ore per day. The estimated cost of this smelter, when completed and ready for operation, is placed at $8,000,000. The plant is being constructed in such a manner as to permit the easy installation of additional furnaces if the production of the mines demands it. Several hundred men are busily engaged in the work of construction and the force will be increased in the course of a few weeks. The lack of building materials has been a serious impediment to rapid progress, but the first unit of the plant will be in operation early next fall.——The principal copper mines are situated at various distances from Ely, but few being close to the city. The most prominent in the Ely district are: The Nevada Consolidated, Ely Consolidated, Pittsburg-Ely, Cumberland-Ely, Giroux Consolidated, and Ely Witch companies. In the Cherry Creek district are the Gold Cañon, Exchequer, Cocomongo, Tea Cup and several other promising prospects. In the Blackhorse district, 30 miles east of Ely, the Amalgamated Nevada properties are promising.——The greatest progress has been made in the Nevada Consolidated, Ely Consolidated, and Cumberland-Ely properties. The formation in those properties is strikingly similar and the ore is usually a sulphide. The veins are of great size and will average 4% copper.——The greatest mine in the district is the Nevada Consolidated, which comprises several properties. This company is capitalized at $6,500,000 and in addition to its mine holdings, owns a half-interest in the Nevada Northern Railroad and the Steptoe smelter. Developments are being pushed on the Ruth and Copper Flat mines and approximately 20,000,000 tons of ore are blocked out. A tunnel is being driven from the Ruth mine to the Star Pointer shaft and is expected to to be completed in four months. A crushing plant will be installed at the Star Pointer shaft and the crushed ore will be loaded into electric cars and taken to the railroad, to be shipped to the Steptoe smelter.——Next to the Nevada Consolidated in value and extent is the Cumberland-Ely property. This company owns 650 acres adjoining the Nevada Consolidated and is capitalized at $6,500,000. This company recently struck the highest grade ore yet encountered in this district in their Veteran claim, at a depth of 430 ft. Drifts and cross-cuts are being driven and the mine is well opened up. The ore assays about 4.5% copper and carries a little gold. This company has a half-interest in the Steptoe smelter and in the railroad being built to the smelter.——Although a younger property than the two already mentioned, the Ely Consolidated gives indications of becoming one of the most important mines in the camp. The company owns 450 acres of mineralized land adjoining the Nevada Consolidated property. Two shafts, the American and Brilliant, have been sunk on the best claims and have reached the sulphide zone passing through some oxidized copper, which assays about 4%, with the usual gold values. While development has not been extensive enough to fully demonstrate the value and area of the ore deposits, such work as has been done indicates that the veins are large and of fair grade. Until the installation of smelters and the coming of cheaper transportation facilities, the low value of the ore will retard production. Ely seems destined to become one of the principal camps in the world.

Ely, Feb. 25.

NEW MEXICO.

RIO ARRIBA COUNTY.

The Tusas Peak Co., composed of Michigan and Wisconsin capitalists, is operating on the Tampa group, near Tusas Peak. The shaft is down 425 ft., and about 1,400 ft. of cross-cutting and driving has been done. A new hoist has been erected, and a Cameron pump is working on the 300-ft. level. A 100-ton leaching plant has just been completed, for treating carbonate ores of copper.

TAOS COUNTY.

It is reported that work will soon commence in the mines in the vicinity of Parsons.——The Silver City Copper Co. has secured control of about 300 acres in the Santa Rita district, where work is being done by the Amalgamated Copper Co. and the General Electric Co. The property is equipped with a concentrating mill, hoisting plant, and a complete working equipment, and one shaft is down 400 ft. The ore carries copper.——The main shaft of the Stephenson-Bennett mine at Organ is down 300 ft., and machinery has been ordered to increase the capacity of the mill from 50 to 500 tons.——It is reported that the Soledad mines in the Florida Mtn. have been sold to the Florida M. & M. Co. The ore carries silver and lead.

Map of New Mexico.

OREGON.

JACKSON COUNTY.

(Special Correspondence).—Tunneling and cross-cutting continues at the Shorty-Hope mine.—— Development work continues on the Golden Spike tunnel, which is in 1,243 ft. The ore at this point has changed in character, showing more free gold. The rich ore-shoots encountered in driving have opened some good ore. The face of the drift is now approaching the south shaft, which is down to the upper

level. A raise will be run at that point for better air circulation.

Ashland, March 10.

(Special Correspondence).—T. W. Hill has been developing a claim in Wagner Creek cañon, four miles west of Ashland, and reports having encountered the lode this week. The work has been done in extending a cross-cut tunnel to tap the vein on the hanging-wall side. The vein was found 140 ft. from the mouth of the tunnel. The same vein had been prospected by a shaft sunk on the dip, on the opposite side of the hill from the tunnel. The shaft is 780 ft. from the end of the tunnel, and a drift is being run on the vein, from the inner end of the tunnel, to reach the bottom of the shaft. This drift along the vein will reach a vertical depth of 800 ft. below the surface, and will give a depth of 1,200 ft. on the dip of the vein. The trend of the vein is north and south, and it will average 20 ft. in width between well-defined walls. A shoot of high-grade gold ore, similar to that found in the old Ashland mine, is known to exist between the shaft and the cross-cut tunnel. This property is a short distance southwest of the Ashland mine, and is on the same vein. The Ashland mine, which was in operation several years ago, was worked to a depth of 1,000 ft. on the incline, and yielded over $1,000,000 in gold, under a costly method of mining. A quantity of the ore contained gold as high as $6,000 per ton. The Ashland mine has been closed down for a number of years, but it would yet be a good paying mine if operated under proper management and with modern machinery.——The Ashland Peak group of gold-quartz claims, situated four miles south of Ashland, on the mountain shoulder of Ashland peak, is being developed by a tunnel run on the vein. The vein averages eight feet in width between well-defined walls. It is uncovered by surface prospect-holes and shafts for three miles along its apex. The quartz is partly decomposed, and contains free gold and sulphides. A 10-in. stratum of the vein on each of the walls contains $60 gold per ton. The balance of the vein will average $2.50 gold per ton, and continues to increase in value as depth is attained. The property can be readily worked by tunnel to the depth of 1,500 feet.

Ashland, March 2.

SOUTH DAKOTA.

The Maitland mine at Garden City is to be incorporated. Heretofore it has been owned and operated by A. Maitland, of Negaunee, Michigan, but he has incorporated it under the name of the North Homestake Mining Co., with a capitalization of $6,000,000. It is reported that the 40-stamp mill will be enlarged to 100 stamps, and it is hoped that there may be a change for the better in the management, which has always been open to criticism. During the past four years the mill has treated 133,162 tons of ore, stamping in cyanide solution. This ore has shown a total value of $1,020,659, or an average battery feed of about $7.66 per ton. The cost of mining and milling is given at $3.31 per ton, but the extraction is only about 70 to 72%. With a capable man with some technical training in charge, there is no reason why this should not be made one of the most profitable of the 'blanket' mines in the Black Hills, although just why it should be called the North Homestake is not apparent, as this mine is in a horizontal, silicious Potsdam sedimentary, which bears no relation whatever to the great mica schist zone at the Homestake, where the ore is practically free-milling.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—In the injunction cases of the Spokane & British Columbia and the Washington & Great Northern railway companies, effecting their rights of way through the Saus Poil valley, for the extension of their lines from Republic to Spokane, the Superior Court has decided the contests in favor of the former. The Washington & Great Northern may appeal to the Supreme Court.

Mining in and about Meteor camp is more active than at any time since the first rush, after the south half of the Colville Indian Reservation was thrown open for mineral entry. The Syndicate M. & M. Co., owning 11 claims, has an adit in 250 ft., and let a contract for 50 ft. more. This company will start exploratory work at once. J. W. Bartlett is the superintendent, and H. D. Presscott, general manager.——A shaft has been sunk on the Queen mine, on a vein of high-grade ore.——The banking firm of Ladd & Tilton, of Portland, has purchased the H. & E. group of four claims and started work on a 500-ft. adit, to cut the vein. M. D. Rankin is superintendent.——The Golden Treasure Co. has driven an adit 300 ft. and expects to tap the vein about 200 ft. farther in.——At the Keystone mine, an adit, in 250 ft., shows the vein to average five feet in width, of low-grade ore, with a width of three feet of high-grade ore in the face.——The Blackthorn Co. has an adit in 300 ft., expects to cut the vein 100 ft. farther in, and is preparing to resume work.——The Stray Dog Co. is hauling ore, assaying in gold and silver about $200 per ton, to the Spokane Falls & Northern railway, for shipment to the smelter.——The Meteor Co. has been taking out ore since the adit cut the vein and will begin shipping as soon as the snow is off. W. A. Halteman is superintendent.——On the east side of the Sherman Mtn. the Gwinn mine is looking well. It has been under bond to Seattle people since last summer and is opened by shaft, drifts, raises, and winzes to the extent of nearly 700 ft. The shaft is down 170 ft., and the drifts from it show the vein to average five feet wide, the greatest width being about 16 ft. The ore is estimated to assay about $45 per ton. An adit, in 125 ft., will be continued 275 ft. farther, and is expected to tap the vein about 300 ft. deep.——The Bridge Creek Mining Co. is developing a vein of silver-lead ore, but has closed down for the winter. It owns five claims on a contact-vein between quartzite and limestone. An adit was driven about 250 ft., 175 of which is on the vein. The ore is galena and lead carbonate and contains some iron sulphide.——A new strike is reported on the Byrne group, at Keller camp, said to be a vein of iron sulphide with chalcopyrite. It was found by cross-cutting from an adit, which it parallels. On one wall, the report says, is a 12-in. streak of galena.——The Dominion Copper Co. has begun shipping ore from the Lone Star and Washington claims, near Danville, just south of the international boundary, to Greenwood, B. C. These claims were purchased a few months ago from the Reservation M. & M. Company.

Republic, March 10.

KITTITAS COUNTY.

(Special Correspondence).—Sylvanite is said to have been found in the Hans Weinegar mine, in a large body of gold-silver ore. This property is situated in the Swank district, near Meaghersville. The company will install machinery during this year.

Republic, March 10.

STEVENS COUNTY.

(Special Correspondence).—Shipments to the coast smelters are now being made from the Old Bonanza mine in the Colville district, north of Spokane, where a well-defined vein has been developed. The new workings are 100 ft. deep and are said to be in a vein that was covered up by the management, ten years ago, the work then being continued by a shaft to a depth of over 200 ft., where a vein of considerable extent and thickness was exploited, with some speculation as to the volume and value of the ore, and was finally abandoned because of the expense of working without proper ventilation, and the low grade of the ore.——Reports from Marcus are that the Little Giant claim has developed six feet of copper ore, east of the old workings, and indications are that the original shaft will be encountered at 200 ft. The new strike runs $150 per ton in gold, silver, and copper, the baser metal predominating. The property is owned by the Domingo M. M. & S. Co.——J. E. Daniels, deputy customs collector at Northport, has received advices from the general board of appraisers at Washington, D. C., removing the duty on zinc in ore, formerly dutiable at the rate of 20% *ad valorem*. This is of importance to Spokane people who own zinc-producing mines in East and West Kootenay, B. C., where thousands of tons are ready for shipment to Iola, Kansas, which is the greatest market in this country.——Harry Shallenberger has secured an option for 90 days on the controlling stock of the Kemp-Komar Copper M. Co.,

which has two claims seven miles nortwest of Loon lake. Some work has been done, including a shaft of 200 ft. Several carloads of 30% copper ore have been sent to the smelters.——New York capital will develop the Mountain Boy group of claims on the south half of the Colville Indian reservation. The property is owned by the Colville M. & S. Co., incorporated for $2,500,000. The Mountain Boy claim attracted considerable attention on account of rich ore.——E. L. Terry, manager of the Reynolds M. & D. Co., which is operating placer mines on the south half of the Colville Indian reservation, has gone to Canada to award a contract on the Gwin mine to continue a cross-cut tunnel in 120 ft., a distance of 400 ft. It is expected to cut the vein at 300 ft. The ore is gold and copper, and it is expected to ship direct to the smelter.——Stockholders of the Advance Mining Co., operating eight claims on the south half of the Colville Indian reservation, at a meeting in Spokane; elected these officers: President, F. Laviginie; and A. M. Campbell, secretary and treasurer. An assessment of half a mill per share on 2,000,000 shares has been levied, to resume operations. Two tunnels aggregating 1,300 ft. have been driven and a winze is sunk 30 ft. below the upper tunnel, giving a depth of 135 ft. below the apex of the vein.

Spokane, Mar. 1.

(Special Correspondence).—The Lead King company in Stevens county, has ordered a tramway and concentrator. The concentrator will handle 75 tons of ore per day, and will be installed and in full operation by August 15, according to the contract. Several ore-shoots have been opened in the property, which is now in condition to supply the concentrator for a long time without further development.——J. R. Ridley of Detroit, Mich., and associates, have bought for $14,000 a group of five placer claims on the west side of Salmon river, opposite the mouth of Slate creek. Mr. Ridley will come west in June and put a force of men at work on the property. Water will be taken from Slate creek, and conducted across the Salmon river by means of a suspension pipe-line.——Directors of the Trade Dollar Mining Co., have arranged with the Revenue company, which is driving the long tunnel to develop both properties, that 25 cents per ton will be paid to the Trade Dollar company for all milling and smelting ore taken out through the tunnel. The contract further provides that the tunnel is to be driven without cost to the Trade Dollar company.

Spokane, Feb. 16.

(Special Correspondence).—A copper ore-shoot, 2½ ft. wide, has been cut in the lower tunnel on the Snowshoe-Snowbird property on Sophia Mtn., 15 miles from Northport, Wash. At a point 350 ft. from the portal of the tunnel a two-inch stringer of quartz was cut. This was driven on for 15 ft., when it widened into the ore-shoot which lies between well-defined walls four feet apart. The property was located 12 years ago by Basile Cortiana. After doing surface work and running a 450-ft. adit, he stopped work.

Harry H. Shallenberger has a 90-day option on the Kemp-Komar copper property, five miles northwest of Loon lake, and 45 miles north of Spokane. There are five feet of ore, which assays 40 to 60% copper, and averages 30% smelter returns in carload lots.

Spokane, March 11.

WHITMAN COUNTY.

(Special Correspondence).—The Bald Mountain M. & M. Co., in the Hoodoo district, is driving on a vein said to assay from 15 to 25% copper.——A shaft is down 300 ft. on the Gold Bug mine, on a vein of gold-copper ore, which assays from $50 to $60 per ton. Drifts have been driven on the vein on the 50, 100, and 200-ft. levels. A spur of the Washington, Idaho & Montana railway is being constructed, and ore shipments to the Tacoma smelter await its completion. A hoist and air-compressor plans will be installed on this property.

Republic, March 10.

BRITISH COLUMBIA.

The shortage of fuel is apparently coming to an end. Le Roi smelter at Northport has resumed operations after a shut-down of several weeks. At Trail, the smelter of the Consolidated company is using another furnace, making three copper furnaces and one lead stack in operation there. In the Boundary district the supply of coal is increasing and the output is growing.

The following is the record of ore shipped and crushed at the Rossland mines for the week ending March 2: Centre Star, 1,590 tons; Le Roi, 2,960; Le Roi No. 2, 595; White Bear (milled), 350 tons. Total, 5,395 tons, or 39,872 tons for the year to date.——The big compressor is being moved from the War Eagle to the Centre Star shaft, and the new hoist has been shipped from Milwaukee.——At Le Roi, there is talk of a rich strike west of the dike, which shows good copper ore.——A carload of concentrates was shipped from the White Bear mill, the result of the treatment of about 350 tons of second-class ore.——A hoisting plant has been purchased for the Inland Empire and will be erected as soon as the snow disappears.——The Trail smelter received 3,942 tons of ore during the week, besides that which came from Rossland. This smelter received from the St. Eugene, Moyie, 150 tons; La Plata, Kokanee creek, 140; Providence, Greenwood, 65; Queen Victoria, Nelson, 43; Iron Mask, Kamloops, 49; Lorna Doone, Silverton, 42; Queen, 23; Whitewater, 35; Lone Bachelor, 21; and Ottawa, Slocan, 20 tons of ore.

In the Boundary district the shipments to smelters were as follows: To Granby smelter, from Granby mines, 9,989; from Skylark mine, 22 tons. To B. C. Copper Co.'s smelter, from Mother Lode, 4,255, and from Snowshoe mine, 1,200 tons. To Dominion Copper Co.'s smelter, from Brooklyn, 1,990; from Rawhide, 1,280; from Sunset, 640, and from Mtn. Rose, 148 tons. To Trail smelter from Snowshoe, 790; from Providence, 30 tons. The total shipments for the week were 20,388 tons, and for the year to date, 123,392 tons.——The Canadian Pacific railway has given notice to some of the Boundary mines that it will not haul any more ore until further notice. This caused the immediate closing of the Snowshoe and the laying off of 40 men. The Rawhide, Mtn. Rose, and Sunset mines, also had to stop shipping.——The Tenderfoot mine, at Copper Creek, near Savona, on the north side of Kamloops lake, has been bonded to Henry Croft, and H. G. Ashby, who have interested English capital in the property.——H. G. Nicholls, the new manager of the Ymir mine, has arrived from London. He reports the satisfactory re-organization of the company, and says work will be started at once.——Plans are being prepared for the enlargement of the Granby smelter, to increase its capacity from 3,000 to 4,200 tons per day.

MEXICO.

GUANAJUATO.

Recent reports state that some of the custom-mills at Guanajuato are saving 92% of the silver and 93% of the gold in the ore.——The Encinallas mine, operating on El Monte system of veins, has been shipping some rich ore.——Some good ore has been struck in the Sirena mine, on the Mother Lode. It is thought that this mine may go into bonanza.——The work on the addition to the Bustos mill at the Cata mine of the Guanajuato Reduction & Mines Co. is about finished. The addition is of 80 stamps, and 80 more will be added soon, making 240 stamps in all. It is estimated that it will take 13 years for the company to mill the old dumps, and in addition to these, it has a great quantity of milling ore which was used as filling in the old stopes in the Valenciana, Cata, Mellado, and Yayas mines of this company.——The Penguico Mines Co. will put in a Butters filter, and a contract for another has been signed by the Mexican Mining & Transportation Co.——Designs are being prepared for a 60-stamp mill for the Tajo de Dolores, and the mill and cyanide plant will be erected as soon as possible.——The Cia. Min. Santa Gertrudis y Anexas at Pachuca, will build a cyanide annex to their hacienda, at once.——The Guanajuato Reduction & Mines Co. is constructing a return-solution line from the cyanide plant to the Bustos mill. The line will be nearly a mile in length, and when it is completed, the company will begin stamping in solution.

DURANGO.

English and French capitalists secured an option some time ago in Los Reyes group of mines in the Guanaceví district of western Durango. It is now reported that they intended to buy the property, for $300,000. The syndicate is a powerful one, and will operate on a large scale

Special Correspondence.

London.

The Chartered Co.'s Report.—Progress in Rhodesia.—New Railroads.—Increasing Gold Yield.—Broken Hill Proprietary.—Big Figures.—Mount Morgan and Its Copper Output.—Another Australian Copper Venture.—Output of Mexican Mines.—Cornish Mining.—Some Criticisms.

Judging from the report of the British South Africa (Chartered) Co. just issued, steady progress continues to result from the operations in Rhodesia. The balance sheet for the year ended March 31, 1906, shows the general expenditure to have been £803,812 and the revenue, £698,043. For the year ending March 31, 1907, the general expenditure is estimated at £802,395 and the revenue at £718,951.

In Northeastern Rhodesia the past year has been uneventful. The conduct of the natives has continued to be satisfactory. Large numbers have been employed in Southern Rhodesia and the neighboring parts of Northwestern Rhodesia, and it is considered that the circulation of the money thus earned cannot fail to have a favorable effect. A hut-tax is now levied over the greater part of Northwestern Rhodesia, and is being paid in a satisfactory manner. An edict has been proclaimed by Lewanika formally abolishing slavery in the Barotse valley. It is hoped that this edict will have the effect of improving materially the conditions of living among the natives, and that it will also strengthen the influence of the administration. Notwithstanding the continued depression in South Africa, the past year in Rhodesia has been marked by increased activity in mining, agriculture, and other industries. The supply of native labor drawn from local sources in Southern Rhodesia remains inadequate for the growing requirements of the country, and as long as there is a scarcity of labor in Rhodesia itself, the directors feel strongly that no recruiting in any part of Rhodesia by the Witwatersrand Native Labor Association for the mines in the Transvaal should be permitted. With regard to railway extension, the main line from Kalomo to the Rhodesia Broken Hill mine in Northwestern Rhodesia was completed in June last, and was opened for public traffic in September. Its construction has involved the erection of a magnificent bridge over the Kafue river, more than a quarter of a mile long. Completing that portion of the Cape to Cairo line has carried the railway into the heart of Northern Rhodesia, to a point situated about 374 miles northeast of the Victoria Falls and about 100 miles to the south of the Congo Free State border. A short extension of the Ayrshire railway for a distance of 12 miles to the Eldorado mine, in the Ayrshire district, has also been completed, and was opened for traffic on July 12. The Victoria Falls Power Co. is already engaged in taking over the various properties that it has acquired, in supplying its customers from its existing plant, and in arranging for the erection of its new works. The board believes that it will now be possible to satisfy the demands for power in Rhodesia at cheaper rates than would have been practicable had it been necessary to undertake this supply independently.

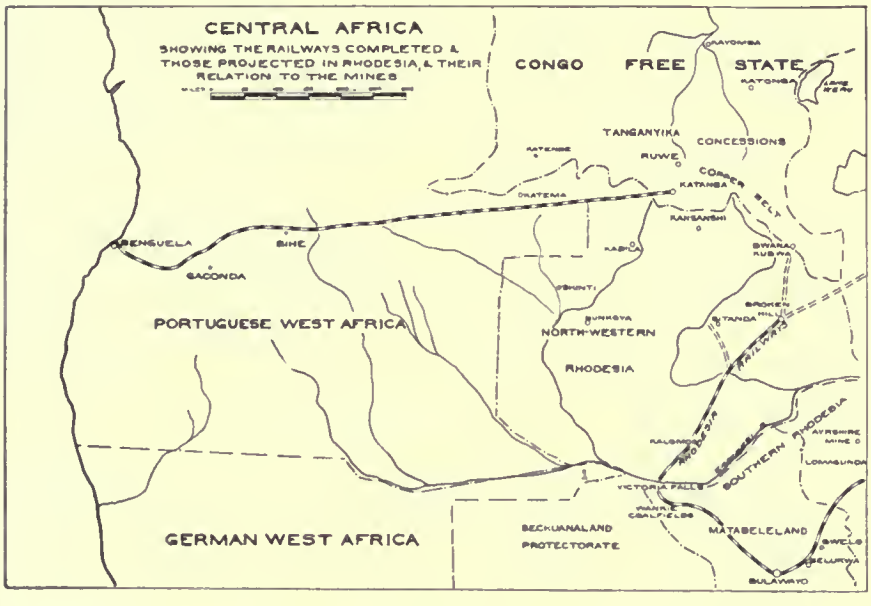
The progress of the mining industry of Rhodesia since the year ended March 31, 1906, has been remarkable. In the gold industry, in particular, a series of new records has been established, the highest production in any one month having now reached a total of 50,127 oz., as against 37,116 oz. in 1905 and 28,100 in 1904. The increase in the total production has been even more satisfactory. In 1906 the total was 551,895 oz., having a cash value of upward of £2,000,000, and showing an increase of 144,847 oz. over the total for 1905, and of 284,158 oz. over 1904. The output of minerals from Northern Rhodesia has also commenced and though, owing to a variety of circumstances, the total tonnage up to the present has been small, there is every reason to believe that the expectations of the Board in regard to the promise of this important mineral district will be fulfilled. Mr. Ackerman has recently visited the Rhodesia Broken Hill mine, the Bwana M'Kukwa mine of the Rhodesia Copper Co., and the Kansanshi mine of the Tanganyika Concessions, and in each case he has given a report which the directors regard as encouraging. The total production of diamonds up to the end of December last was 1,849 carats, the stones being of exceptionally fine quality and commanding high prices. Outside the areas controlled by the Willoughby group a number of prospectors have been at work; but no important finds have been made. Certain alterations have recently been made in the terms given to diggers in the districts that are now engaging attention, and special inducements have also been offered to discoverers of any new fields situated at least 100 miles from any previously known deposit.

According to a cable from the Broken Hill Proprietary, half-yearly statements have been issued showing a profit for the six months ended November 30, 1906, of £314,284, net assets £614,681, and profit and loss account shows a credit balance of £689,046; £22,387 has been expended in construction during the half-year, of which amount £8,991 has been on account of electric power plant, £2,944 electric light, and £2,910 spelter plant. The erection of one unit of spelter plant has been completed, but, as anticipated, further modifications are necessary. The position in regard to the fire is in every way satisfactory; the general manager's latest report is that no further damage is likely. Developments on the 1,200-ft. level are most satisfactory; the quality of ore is fully equal to that on the 1,000-ft. level; the lode has widened more than was expected, and this development has added largely to the ore reserves, which, upon a moderate estimate, are given as 3,000,000 tons, against the previous estimate, in May, 1905, of 3,200,000 tons, since when 828,000 tons have been extracted. The tonnage of ore raised shows an increase over the previous half-year of 64,024 tons, the total being 293,271 tons. The zinc-concentration plant has worked satisfactorily, producing 31,131 tons of concentrate for the half-year; some modifications have been made, the result of which has been favorable, both with regard to working costs and better recovery of the metals. Output for the half-year has been 2,413,066 oz. fine silver, 29,383 tons pig lead, the average prices obtained being, for lead £16 5s. 5d. per ton; for silver 2s. 9.73d. per oz. fine.

An interesting report from the Mount Morgan has also been received for the six months to November 30, 1906. The total revenue for the period amounted to £448,138. The total expenditure has been £271,682. After payment of the regular dividends, aggregating £75,000, and writing £24,699 off plant, machinery, and property, there remains a profit of £78,678. The ore treated at the Mundic works has maintained the value obtained last half-year; but the oxidized ore treated at the West works shows a falling off in value of 5s. 9d. per ton. The copper reduction works have produced 1,751 tons of copper, containing 20,838 oz. gold, which have been shipped to America under advance, in terms of the contract entered into with the Delamar Copper Refining Co. The Board has authorized the erection of an additional blast furnace, extensions to the converter-plant and power-house, and other expenditure referred to in the general manager's report, estimated to cost approximately £125,000. The manager is considering the advisability of erect-

ing an electrolytic copper refinery. With a view to ensuring an abundant supply of suitable ironstone flux, several leases have been acquired and are being opened up. Owing to the increased consumption of water, provision is being made for the additional storage of about 56,000,000 gal. by raising the wall of the No. 7 dam. When the work is finished, the total capacity of all dams will be 376,000,000 gallons.

No slackening of attention to copper mining in Australia is apparent in the London market. It is now reported that as the result of the communications that have passed between London shareholders of the Mt. Elliott mine and the directors in Australia, the latter have decided to recommend that the whole of the assets of the present company be transferred to a new company, to be registered in England, with a capital of £750,000, divided into 150,000 shares of £5 each. Shareholders will receive one fully paid-up share of £5 in the new company for each share of £1 held in the old company, the balance of 30,000 shares of £5 each being held in reserve. The recently formed Great Cobar North Ltd., with a working capital of £100,000, is said to possess a property that is likely to become a large producer.



Mainly as the result of the increase in price of the metal, the Arizona Copper Co. shows an improvement for the financial year to September 30 last, the free profits having been £503,000, an excess of £142,000 compared with the previous year. This has enabled the company to pay dividends this year of 105%. Last year it was 75%. The price of copper obtained for the year averaged about £66 per long ton; last year it averaged £80. The company is not getting up to £109 per long ton. The grade of the ore has fallen, however, to 2.14% from 2.40% in the previous six months, but the main cause of the slow production is the scarcity of labor. When the new mills were all finished and ready to put into operation, the necessary additional miners and laboring men could not be obtained.

The profits are announced for the month of January from Esperanza, Camp Bird, and El Oro, as $188,987, $208,874, and $82,490 respectively. Shipping ore on hand, 1,543 tons. The manager reports that the car situation is very serious; no cars are supplied by the outside roads, and ore is stacked and piled up in every available place. One *patio* remains yet to be filled, but this will hardly handle another week's production. Everything possible is being done, without success.

At the annual meeting of shareholders in the Basset Mines held at Redruth, Mr. Francis Oats presiding, the accounts showed a net profit of £10,427. The chairman said that the present price of tin would encourage mining for that metal in every part of the world. Their directors determined to develop the property as fiercely, he might say vehemently, as possible. He contended that the success of Cornish mining depended upon more extensive development, and its failure could be attributed to the idleness of some of the miners. Cornishmen had been attacked and reflected upon for their alleged conservatism in mining methods. As one who had given his life to mining, he would deny the allegation and claim that at Basset, at any rate, they were proceeding upon proper lines. They could not revolutionize Cornish mining by waving a magic wand and saying presto! These remarks of Mr. Oats were, no doubt, intended for the benefit of present-day speculators who are to be found going up and down in the country seeking to "make a bit!" These invaders wish to see their mines worked for all they are worth—for themselves; they have no sympathy with the traditional keeping of something in hand for the next generation. For them, hand-drilling is wasteful in loss of time, and motive power represented by a combination of windlass and bucket and a wheelbarrow with a man at one end creeping along a plank, is an abomination unto them. There is no question but that the lagging behind with development and output, which has been too apparent during the past year, even with tin at top price, is the danger spot in Cornish mining. In this respect Dolcoath, the leading mine, is as faulty as its neighbors. It may be that the management are holding their hands, until they have struck a bargain with the new 'Lords' anent the resumption of Williams shaft, otherwise it is inexplicable that a shortage in the tonnage should have been allowed during the last six months.

Butte, Montana.

The Affairs of the Raven.—To be Re-organized.—A Curious Story.—North Butte Finds Rich Stuff.—The East Butte Developments.—Butte & London.—Manager's Annual Report.—Encouraging Prospects.—Rapid Shaft-Sinking.

The Raven Mining Co., which had a skyrocket experience about a year ago, will probably be re-organized and its capital stock increased. As was repeatedly asserted in these letters when the Raven was prominent before the speculating public, the company has some excellent property in the Raven and Snoozer lode-claims. The Raven, which has been developed to a depth of only 700 ft., not deep enough to reach the copper deposits, has produced a lot of good silver ore.

The company devoted its work mainly to the Snoozer claim, of which it owns an interest to the extent of six-sevenths, the Butte Coalition Co. owning the other seventh. By an arrangement with the Anaconda Co. the Raven used the shaft of the Buffalo mine, situated south of the Snoozer, the shaft being 2,000 ft. deep, and by a further arrangement with the owners of the Old Glory claim, lying between the Buffalo shaft and the Snoozer claim, the Raven Co. drove a cross-cut from the Buffalo shaft into the Snoozer and opened two veins in the latter ground that were developed at the 800-ft. level, at the 1,200, and at the 1,500-ft. levels. On the lowest

level a lot of good commercial ore was found, but the orebodies were not continuous. A lot of ore was shipped and then, when everything looked bright for the company and its stock had advanced from 50c. to $7.50, the company went into the air. Without notice the Anaconda Co. took its shaft from the Raven Co. and the Butte & Boston Co., another Amalgamated concern, laid claim to the apex and ownership of the vein upon which the Raven Co. had done most of its work and on which it had been mining. W. D. Thornton, a close business associate of the Amalgamated officials in Butte, was at that time president of the Raven, and his close friendship with them inspired public confidence in the Raven. He was blamed for the trick played on the public. All operations by the Raven ceased and no effort was made by the officers to test or dispute the claim of the Butte & Boston. Raven stock went back to 50c. Before the shut-down the Old Glory Co. was organized and one of the owners of that property claimed the second vein opened in the Snoozer and threatened injunction proceedings. He also made overtures for a consolidation of interests, which were not considered by the Raven people.

Raven has been dormant for a year. Now interest has been revived by various rumors, one of which is that the Raven and Old Glory are about to be consolidated and that the Coalition and Amalgamated interest in these properties will be put in with the others to form a new company. As that is so contrary to the known policy of the Amalgamated Co., little credence has been given to the story in Butte, its place of origin being Boston. Propositions to that end have been made by Raven and Old Glory interests, but so far nothing has come of them. Another proposition, on which much effort has been expended, is to re-organize the Raven Co., wipe out its evil name, increase the capitalization, and raise money with which to develop the Raven claim, leaving the Snoozer and Old Glory out of the present reckoning. In the opinion of mining men there is little doubt that at a depth of 2,000 ft. in the Raven a copper vein would be opened. The company is capitalized for only $500,000, but it carries a bonded debt of $30,000.

The North Butte cut two veins in the cross-cut north from the 1,600-ft. level of the Jessie mine, but the first vein is only six feet wide and carries only low-grade ore. The second vein, cut in the Berlin ground, is reported to be about 28 ft. wide and a large portion of it carries copper glance.

The north cross-cuts run by the East Butte on the 400 and 600-ft. levels have opened several good veins, the lower cross-cut having also encountered streaks of copper glance. The south cross-cuts are in almost continuous ore. The company is mining and hoisting ore and making shipments to the Washoe smelter, of the Amalgamated, as rapidly as cars can be secured for the transportation.

A new smelting rate has been secured from the Washoe, the rate being as low as that granted any other mining company in Butte. It will make unnecessary the building of a smelter by the East Butte Co., a project under consideration for some time.

A. A. McMillan, general manager of the Butte & London Copper Development Co., has made his first annual report, in which he covers the first year's work. A three-compartment shaft has been sunk to a depth of nearly 900 ft. One station was cut at 400 ft. and a large one at 800. In sinking the shaft several veins were cut. One of these, says Mr. McMillan, is so promising that the company was asked for a lease on it by some practical miners. However, the lease was refused for the reason that work on the vein might open some new water chambers and let the water down the shaft, thereby making pumping more expensive. The policy of the company is to sink to the 1,500-ft. level before doing any cross-cutting or driving. The reason for going so deep is that on the North Butte Mining Co.'s property, which approaches to within about 700 ft. of the Butte & London ground, they have had to go to about the same depth before finding their great orebodies. The Butte & London Co. has one of the best and most up-to-date plants in the district. It includes a boiler room 36 by 54 ft. with concrete foundation, with four Allis-Chalmers tubular boilers of 125 h.p. each; an engine-room 43 by 50 ft. with an Ingersoll-Sergeant duplex steam-driven air-compressor capable of operating 12 drills; a first-motion hoisting engine on concrete foundation, capable of working to a depth of 2,000 ft.; well-equipped machine and blacksmith-shop, carpenter and timber-framing building equipped with machinery, this building being connected with the shaft by tramway; a modern change and dry-house for miners, fitted with baths of hot and cold water, individual lockers, etc.; a fine office-building, 18 by 36; a head-frame 38 by 60 by 75 ft. high, built of No. 1 Oregon timber, and the plant has been connected with the city water system, fire plugs and hose being installed for protection.

The company has paid out, for all the work, improvements, and salaries to date, $162,808, and has $264,717 in the treasury. Mr. McMillan says the development of the property so far has been exceedingly encouraging. The financial position of the company is said to be satisfactory and the first year's progress more than gratifying.

Goldfield, Nevada.

The Labor Situation.—High-graders Convicted.—Ore Shipments.—Shortage of Mining Timbers.—New Producers.—The Montana-Tonopah Mill.

The labor situation in the Goldfield district is causing some anxiety to the operators. It is not probable that the trouble threatening the camp will come to an immediate head, as the strongest feeling is now between the various labor organizations. The Industrial Workers of the World, which has absorbed the Western Federation of Miners, has become aggressive in an attempt to force the carpenters' union to join them. The men resent this, and a murder attributed to the I. W. W. has aroused the indignation, not only of the carpenters, but also of many miners, who wish to sever their affiliation with the Industrial Workers of the World. As a result of this, all miners and millmen have been called out, and a procession was formed to march through Goldfield to protest against the control of the miners' affairs by unions of other crafts. The miners say that their hours and wages are satisfactory to them. The greatest difficulty now is the opposition of the other crafts. The waiters' and cooks' unions say that they will refuse to serve the miners, if they are independent of the I. W. W., and the labor organizations are making an absurdity of their affairs. It is expected by the operators that the present trouble will soon blow over, and work be steadily resumed.

A jury has convicted two Goldfield men at Fallon, Nevada, of having received, without right, a certain quantity of rich ore from the Mohawk, valued at $5,000. The ore was taken out of Goldfield in a trunk. This ore was identified as coming from the Mohawk mine by the officers of the company. This conviction for 'high grading,' which is one of the first obtained in the State of Nevada, is satisfactory, as it is the receivers of the ore, who reap the greatest profits at the least risk, that have to pay the penalty. Shipments from Goldfield mines

aggregated 518 tons during last week. Of this, 406 tons were treated at the Nevada Goldfield reduction works. The output has been seriously reduced by the lack of mining timbers. At some leases, work has been suspended for this reason. It is expected that several properties will be added to the shipping list next week. These should include the Morton-Beesley lease, the Little Florence, Mohawk Con., Higginson lease on the Jumbo Extension, and the St. Ives lease.

During the past week the following properties contributed to the shipping list: Red Top, Loftus & Davis, McKenzie, Jumbo, Curtis Mohawk, Gold Bar, Combination, and Frances Mohawk.

The report of Mark B. Kerr, consulting engineer for the Montana-Tonopah Mining Co., shows that the mining cost on the ore shipped is $36.25 per ton. The gross returns from 2,315 tons averaged $53.53 per ton, except the last car, which is expected to average $80 per ton. The new 40-stamp mill, designed by F. L. Bosqui, is nearing completion and the treatment of the ore by mill-

Utah.

ing will prove much more economical than sorting and shipping the best of it to the smelters. An extraction of between 85 and 95% of the gold and silver is anticipated.

The process decided upon is as follows: Crushing to ½-in. ring in a series of Gates gyratory crushers, using one No. 5 and two No. 3 machines. The ore is elevated to the mill-bins on a belt-conveyor, whence it passes to eight batteries of five stamps each, provided with 12-mesh wire screens. It is expected that the service of these stamps will be between 150 and 200 tons in 24 hours. The product from these stamps is classified, the coarse material passing to eight Wilfley tables, while the slime and fine go to two Dorr classifiers, which precede the tube-mills. The tailing from the Wilfleys also goes to these classifiers, whence the coarse product goes to the tube-mills for re-grinding. It is proposed to grind to 150 mesh in these mills, of which there are two, each 5 by 22 ft. The re-ground product from the tube-mills joins the overflow from the Dorr machines, and the whole product then passes to two large cone-classifiers. The underflow from these cones goes to 16 Frue vanners, and the overflow joins the stream of tailing from the vanners and runs to the settling vats in the cyanide plant. From the settlers the pulp is taken as required to the agitators, of which there are six of the Hendryx type. After agitating in a cyanide solution, the pulp is drawn off to a large reservoir, where it is stored for filtering by means of the Butters vacuum filtering process. The gold and silver-bearing solutions recovered from the Butters filter will be precipitated on zinc-dust in the Merrill precipitation press, which has been so successfully used at the Homestake mine.

Salt Lake, Utah.

News from Bingham.—New Concentrating Mills.—Dividends.—Activity in Beaver County.—The New Foundland District.—Washouts on the Los Angeles Railroad.

It has been learned from Bingham that the new aerial tramway erected by the Utah Apex Mining Co. recently is giving satisfaction and that shipments of ore are being made to the Salt Lake smelters with regularity. To provide facilities for the opening of the mine at greater depth, the management is installing a new and more powerful hoist. The Parvenue adit has been extended into the mountain 2,360 ft. At present considerable energy is being displayed in exploiting the Leonard vein, lately intersected by the adit.——Rapid progress is being made with the construction of the concentrating mill of the Markham Gulch Milling Co., which is owned jointly by the Utah Apex and New Red Wing companies. The building is enclosed and the installation of equipment is in progress.——The City Rocks Mining Co., with mines at Alta, has succeeded in straightening out some titles to its property and the management has announced that it will soon begin a more vigorous campaign of development and ore extraction.

The Utah Consolidated Mining Co. has announced a dividend of $450,000 for payment to shareholders in April. It has been decided to make quarterly distributions hereafter.——The first two units of the Utah Copper Co.'s new mill at Garfield are completed; but some delay is being experienced on account of the power-plant, which will not be ready for operation for about two weeks. Good headway is being made with the mill of the Boston Consolidated Co., and the management gives assurance that it will be ready to treat ore by the middle of the year.

The Western Pacific has completed the laying of track 125 miles westward from Salt Lake City. The construction of this new transcontinental line and the prospect of another road being built between Salt Lake City and Ely, Nev., has given mining in the Deep Creek district a wonderful impetus and this year promises to witness much mining activity in that region, which covers a large area in western Utah and eastern Nevada.——The directors of the Bullion Beck & Champion Mining Co., have declared a dividend of 10 cents per share, or $10,000, for payment to shareholders during the present month.

There has been considerable inquiry for mining property in Beaver county of late. The great showing that has been made by the Newhouse Mines & Smelters corporation in the Cactus copper mine having stimulated interest in that portion of the State. The Newhouse company will net something over $250,000 during the present month's operations.——The Cedar Mining Co. is shipping regularly from its Beaver county mine, which has been opened to a depth of 275 ft. The company is marketing ore running about $85 per ton.

The Wasatch Copper Co., of which W. D. Pyper of Ogden is manager, is about to begin ore shipments. This company's mine is near Brigham City.——Much activity is reported from the New Foundland district on the west side of the Great Salt Lake. Among the principal properties under development there is the Copper

Mountain mine of the Salt Lake City Copper Co., which is controlled by the Lewisohns of New York.

The ore and bullion settlements reported by Salt Lake banks last week aggregated $602,000.

The washouts along the line of the San Pedro, Los Angeles & Salt Lake railroad in southern Nevada are serious and it is said that the management of the road is contemplating the abandonment of the line through the Meadow Valley wash south of Caliente where the water has played such havoc. The trouble has occurred in exactly the same place as it did a year ago.

Toronto, Canada.

New Silver Districts.—The Tax on Mines.—Shipments From Cobalt.—Developments in the Mines.—Several Rich Strikes.—Machinery for the Laurentian.—Annual Yield of Ontario.—The Output of Cobalt.—Larder Lake.

The area in the neighborhood of Elk lake, which is an expansion of the Montreal river about 50 miles northwest of Cobalt, is proving attractive to prospectors and many have gone there from Cobalt and located claims. A short distance westward lies Silver lake, where some good finds have been made of native silver, and a number of locations have been staked. The rock is described as similar to that of the Cobalt area, being diabase and conglomerate. A great rush to this part is expected in the spring. The first step toward opening up the Larder Lake gold area by railroad communication was taken this week by the Temiskaming & Northern Ontario Railway Commission, which as a preliminary to deciding on the route for a branch line has sent out a party to survey the country between the line and Larder lake. The distance will be less than 20 miles.

The all-absorbing question among mining men just now is the proposed tax on mines and mineral lands, the bill for which has received its second reading in the Legislature, although the amount of the tax has not yet been announced. Strong protests have been made at public meetings and by deputations, but so far no decisive result has been reached. Considering the matter purely from the standpoint of political probabilities, it looks as though the Government in the end would let themselves down gently by accepting the suggestion of the mining interests to appoint a Royal Commission to investigate the whole subject, and in the meantime leave matters as they are.

Shipments of ore from Cobalt for the week ending February 23, amounted to 215 tons from the following mines: Nipissing 50 tons; Coniagas 31; Silver Queen 20; Foster 33; Cobalt Central 17; Buffalo 30, and O'Brien 32 tons.

At the Hunter-Cobalt, directly north of the Green-Meehan, a shaft has been sunk on a vein of cobalt and calcite to a depth of 40 ft. Another shaft at a distance of 200 ft. from the first vein is down 35 ft.——Development work is just being begun on the property of the United States Cobalt Co., adjoining the Nancy Helen. Contracts for sinking a shaft and erecting camp buildings have been let. Stafford Higgins is in charge.——Operations with a diamond-drill on the property adjacent to the Silver Bird have resulted in the discovery of two veins rich in silver and cobalt, four and six inches wide respectively, at 100 ft. below the surface.——The Ontario-Quebec Cobalt Co. reports a strike on its property in Bucke township, about two miles from Haileybury, the ore assaying 4,576 oz. per ton.——Ore taken from the Nado property, owned by the Canadian Central Mines Co. on the Montreal river, adjoining the Edison claim, is reported as assaying 902 oz. per ton. It was taken from an 18-in. vein of smaltite, showing 5-in. niccolite.——At the Victoria mine, native silver has been struck in the main shaft. Energetic development has been carried on under the management of Charles Gifford, formerly of Spokane. As a result of extensive trenching nine veins have been found. A plant is being installed.——The Dufferin Silver Cobalt Co. has done over 1,200 ft. of stripping and has unearthed seven veins, varying in width from 4 to 12 in. Robert Shillington is superintendent.——At the Red Rock the new plant is being erected at the centre of the property so as to work all the shafts conveniently. When the plant is up four drills will be put to work and day and night shifts kept going.——The Cobalt Lake Co. has come to an agreement with the Nipissing, by which the former company will be allowed to sink shafts on the Nipissing property anywhere on the eastern side of the lake. The Nipissing Co. had erected its power-house, crusher, etc. on the Cobalt Lake property, and in consideration of the privilege of sinking shafts from which adits can be run beneath the lake, the Nipissing's buildings are allowed to remain.

Shipments of ore from Cobalt for the week ending March 2 were 291 tons, from the following mines: Buffalo, 30 tons; Green-Meehan, 34 tons; La Rose, 28 tons; Nipissing, 74 tons; O'Brien, 97 tons; and Silver Queen, 27 tons.

A. L. McEwan, the manager of the St. Anthony Reef gold mine, Sturgeon Lake district, has brought bullion of the value of $2,500 to Port Arthur, the results of the last clean-up. The mine is being taken over by a new company, the leading man of which is Mr. Wealock, of Saginaw, Michigan.

There is great activity in recording claims in the mining recorder's office at Haileybury, which is largely due to the rush to Larder lake. Long files of men stand waiting for hours for a chance to file claims or take out prospector's and miner's licenses. Business is active at all points in the Temiskaming country, owing to the mining boom, and everything points to a great influx into this region, especially Larder lake and along the Montreal river. The Larder Lake Proprietary Mines, Ltd., has ordered a plant, comprising a five-stamp mill, 20-h.p. engine, and 25-h.p. boiler. Free gold has been found on the Maple Leaf claim on Dublin Bay at the northwest end of the lake. Twenty men are employed on this property.

The Ontario Department of Mines has issued a report showing the mineral production of the Province for the year 1906, which amounts to a total of $22,221,808, as compared with $17,854,296 in 1905. The metallic production was $13,179,162, and the non-metallic $9,042,646. The money equivalents are based on the value of the product in the form in which it leaves the country, not on the basis of the price of the refined metals in the New York or other foreign markets. If the latter plan were adopted, as is done by the Canadian Geological Survey, the total value would be about $30,000,000. The following table gives the metallic production:

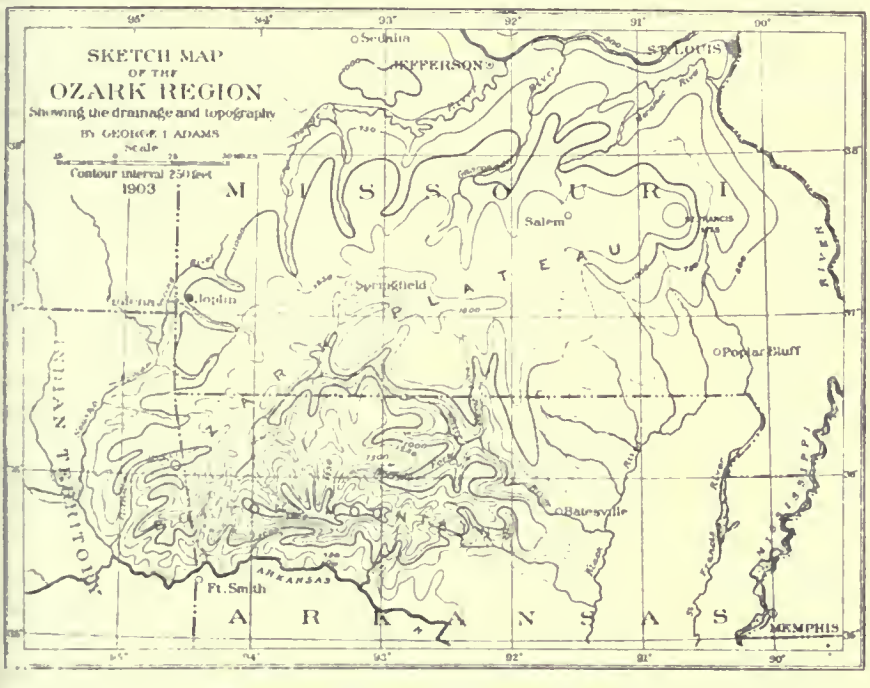
	Quantity.	Value.
Gold	3,519 oz.	$59,274
Silver	5,357,830 oz.	3,543,089
Cobalt	312 tons	30,819
Nickel	10,932 "	3,836,419
Copper	5,910 "	998,548
Lead	.....	93,500
Iron ore	128,099 "	301,032
Pig iron	275,558 "	4,554,247
Zinc ore	400 "	6,000
Total		$13,422,928
Less value Ontario iron ore smelted into pig iron (101,569 tons)		243,766
Net metallic production		$13,179,162

The most noteworthy feature of the non-metallic products is the growth of the portland cement industry, the

output of which was 1,598,815 bbl., valued at $2,381,014, an increase of $597,563 as compared to 1905.

The output of the mines of Cobalt during the year was: Silver, 5,357,830 oz., value $3,543,089; cobalt, 312 tons, value $30,819; nickel, 156 tons, and arsenic, 1,558 tons, values of the two latter not given. Up to the end of 1906 Cobalt had produced: Silver, 8,016,061, value $5,015,479; cobalt, 446 tons, value $150,779; nickel 245 tons, value $13,467, and arsenic, 1,919 tons, value $3,596, the last three items being no source of profit to the mine-owners.

A large quantity of machinery has been ordered by Anthony Blum, general manager for the Hugo von Hagen Exploration Co., for the Laurentian gold mine, on Manitou lake, including a 50-h.p. duplex steam-pump capable of raising 500 gal. water per minute. It will be installed at Crystal lake to supply the mine, the present pipe being sunk below the frost level.——H. D. Alston, managing director of the Manitou Mines Co., has gone East to purchase machinery for the development of the Victory gold mine.



Map Showing Position of the Joplin District.

Joplin, Missouri.

Ore Production.— Continued Increase.— New Strikes in Drill-Holes. More Leases Being Worked.— General Activity.— A New Mill.— Companies Organized.

The highest price reported paid for zinc ore for the week ending February 23 and March 2 was $53.50 for ore from the Missouri Lead & Zinc Co.'s land, and also from the Continental Zinc Co.'s land in Joplin. The highest price reported for lead ore for the week ending February 23 was $87.50 at Granby, and for the week ending March 2, $86 per ton for some choice bins at Webb City and Granby. The car situation seems to get worse, and as a result one-third of the shipment last week from Webb City was made in coal-cars.

Shipments.	Zinc ore. Lb.	Lead ore. Lb.	Combined Value.
Week ending February 23	11,880,600	1,635,170	$351,500
" " March 2	10,975,970	1,931,910	311,957
Up to date	104,313,670	14,670,350	3,049,411
Same period last year	87,582,030	12,325,750	2,437,135
Increase	16,731,640	2,344,600	612,276

Frank Reynolds, who for years was a member of one of the Joplin fire departments, resigning a few months ago, is interested in a mine southwest of Joplin that has become a promising producer. Much development work is reported from Peoria; there has been one turn-in from that new camp already this year, and it promises to make a splendid showing. Harley and Charley Wells, of Joplin, have made a rich strike by drill on a lease of the Henderson land and adjoining the famous Morning Hour property, among the richest in the entire district. The boys have put down two drill-holes, and a 25-ft. face of high-grade ore was encountered in each of them. They will drill a few more holes, and intend sinking a shaft on the most promising one.

James Campbell, of the Missouri Lead & Zinc Co., has purchased from the Muncie Mining Co. the 200 acres known as the Shepherd farm, lying west of the Rex Mining & Smelting Co.'s 1,000-acre tract, and northeast of the Missouri Lead & Zinc Co.'s large holdings. The Fox Mining Co., composed of Thos. Dolan, E. F. Cameron, P. E. Gardner, Hugh Dabbs, J. C. Crampton, and M. H. Fox own a lease of nine lots on the land of the Granby Mining & Smelting Co., situated between Lone Elm and Possum Hollow. This lease has never been prospected, and they have already encountered a body of free ore between the 70 and 90-ft. levels. They have installed a steam-hoist and three hand-jigs, and will enter the list of producers at once.

A company composed of Charles Bartlett, H. Wells, P. Harney, and others, of Joplin, has just put down a second shaft on the Musselman land east of Duenweg. The company has a lease on 20 acres, and has put down nine drill-holes, seven of which showed 20 to 30 ft. of ore-bearing ground. In the first shaft sunk an 18-ft. face of lead was encountered, and in the last, or second shaft, a 22-ft. face of zinc was gone through. It is the intention of the company to erect a modern mill within the next sixty days.——The Goodrich mill, just completed at the George H. mine, owned by the Federated Mines & Milling Co., at Prosperity, was intended to be put in operation Tuesday morning, but Monday morning a gentle March breeze came along and blew down the smoke-stack, delaying operations a few days. The George H. mill has been making some wonderful turn-ins from this property, and so much ore is in sight that it was thought advisable to build another modern mill on the lease. They are working the sheet ground, which means several years' work for both mills.

A. C. Roper, and associates, of Carthage, have leased 100 acres of land belonging to Frank Thompson and Mrs. McFall, situated four miles northeast of Carthage, and will thoroughly test the land by drilling. About 12 years ago it is said five drill-holes were sunk; four of these showed large bodies of zinc ore and a sprinkling of lead. At that time, however, the price of both ores, and especially zinc, was very low, and a disagreement in the company prevented anything being done, but now, with $50 zinc and the mining fever at white heat around Carthage, the value of the land for mineral purposes will be tested thoroughly.—— Parties operating the Eureka mine on the Boston-Aurora ground, at Aurora, who are exploring old workings at 270 ft., have opened up a large face of good zinc ore, and should it continue to show up as good in the next few feet, it will prove to be one of the best properties in that district.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE zinc-tannin process is used to preserve railroad ties.

MORE than nine-tenths of the rocks of the earth's surface are fragmental in origin.

STERLINE is an imitation-silver, containing 69% copper, 13% zinc, and 18% steel.

THE term 'terrane,' or 'terrain,' has essentially the same significance as formation.

ELECTROLYTIC ZINC, running as high as 99.94%, is beginning to find its way into the market.

THE best method of utilizing peat is that of converting it into coke with the recovery of the by-products.

THE principal alloys in which lead is found are those used for solders, bearing metals, and type-metals.

JAW-CRUSHERS are intermittent machines, while spindle or gyratory breakers are continuous machines.

AN assay-slag from the crucible-assay consists in most instances of silicates and borates of the metallic bases.

OZONE is a form of oxygen in which the molecule contains three oxygen atoms, while in ordinary oxygen it contains two.

ALLUVIAL cones are deposited by rapid tributary-streams at the base of the ridges they descend, where they meet the broad plain of the valley.

FERRO-PHOSPHORUS is useful in the basic steel process for enriching the slag. Thin sheet-steel gets a better finish when rolled, if it contains phosphorus.

CORROSION of iron takes place with water and oxygen, but not with water and carbon dioxide. While carbon dioxide is not essential, it may accelerate the reaction.

IN American practice, ore for assay is reduced to a size varying from 80 to 200 mesh. The unit is the assay-ton, which is to one milligram as the short ton is to one ounce Troy.

THE radiant efficiency of the carbon-filament incandescent lamp is only 0.3%. The Nernst lamp has a radiant efficiency of 0.85%, due to increased temperature, and a selective radiation.

THE current quotation for molybdenite is $400 per ton of 95% molybdenite concentrate. The price varies and is a matter for negotiation. In San Francisco, De Golia & Atkins are dealers in rare earths.

UVAROVITE is a green garnet, which contains chrome, replacing part of the iron, and occurs in the Ural Mountains, Russia. This beautiful mineral has been found recently in Shasta county, California.

THE rotation of the stamp, which is accomplished by the friction of the tappet on the cam, is employed to even up the wear on the shoe and die by causing the shoe to drop in a different position each time.

THE difference in crushing by the Blake and Dodge breakers is apparent when listening to the two machines. The Dodge breaker snaps the lumps apart with a report like a pistol-shot, while the Blake works more quietly.

CLASSIFIERS AND SETTLING-VATS are instances of the principle of free settling, which is where individual particles fall freely, either in still water or against an opposing upward current, without being hindered by other particles.

JOINTS in rocks are often due to slow-acting pressure on the outskirts of a region of disturbance. The joints may be parallel, showing that the pressure has acted with no warping of the beds; or, in other cases, warping or torsion may be strongly marked.

IN estimating the first cost of a stamp-mill, the cost of the battery may be placed at $300 per stamp, not including cost of transportation. The foundations will cost $65 per stamp. Roughly, $1,000 per stamp will pay for a fully equipped mill, ready to start.

THE largest use that is made of graphite is in the manufacture of crucibles, muffles, and other articles designed to be exposed to high temperatures. For this purpose the Ceylon graphite possesses special advantages in its low percentage of ash and in its peculiar physical character.

CRUSHING ROLLS are held in position by their journals, act radially upon the lumps of ore, gradually drawing them toward the narrowest space between the rolls, and finally break them by virtue of a compressed force, superior to the breaking strength of the lumps. The ore is therefore broken by compression.

THE advantage in using conical drums when hoisting in deep shafts lies in the fact that as the weight of the suspended rope in the shaft increases, the radius of the drum (through which it acts) decreases, thus equalizing the work on the engine and motor. These drums are used principally for hoisting in balance.

THE dip of a vein, or stratum of rock, is measured by the angle it makes with the horizontal. In the case of a fault, the same idea is sometimes expressed by the term 'hade,' which, however, is measured by the angle the fault makes with the vertical. When both terms are used with reference to the same occurrence, they are mathematically the complements of each other.

THE life of a railroad tie in the United States may be given for:

Chestnut	5 to 12 years	average	7 years
Cedar	6 to 15 "	"	9 "
Hemlock	3 to 8 "	"	5 "
White oak	5 to 12 "	"	7 "
Spruce pine	4 to 7 "	"	5 "

It will often, especially in the case of the softer and more perishable woods, be true economy to preserve them by the injection of creosote, or by other methods. Creosote also preserves the spikes.

REPLYING to the question: Would it be possible and practical to build and wind an electric motor so that it could be run with a continuous electric current of high amperage and an electro-motive force of only two volts, and give good and efficient power results? The answer is that an efficient motor can be constructed along the lines indicated, but it would be a special machine, which none of the larger electric companies would build. A motor of such construction would require excessive size of copper wire to carry the current at low voltage. The tendency to high voltage is for the purpose of reducing the size of the conductors, and the resulting cost of construction.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanidation at Copala, Mexico.

The Editor:

Sir—Enclosed please find blue print which is self explanatory. It was prepared for the purpose of comparing quickly costs at the various stages and also to graphically describe the present system and compare it with others which have preceded it. You will notice that the acid treatment is entirely dispensed with, all zinc shorts being returned to the head sections of the boxes, not only affording us a marked saving in zinc consumed, but also greatly simplifying the process and saving us the cost of acid, extra filter-press, acid-pump, etc.

The precipitation boxes are of eight compartments with bottom-discharge valves. The slime is run into a screening tank through a No. 30 screen. The tank is made in two compartments, separated by a vertical division having its top six inches below the upper rim of the tank, so that when the first division is full the product overflows into the second (leaving, of course, nearly all the precipitates in the first section) and is then pumped through the filter-press. Both divisions have bottom connections to the filter. This arrangement allows the cleaning of all the boxes without interruption, for, as we very frequently get more than a cake of precipitate in three of the four boxes and as we have to clean all of them daily, without this device we would be compelled to empty the filter before we could complete the boxes. Of course, we open up the suction to the first section when we are ready to make cake.

The precipitate, which contains from 18 to 20% moisture, then goes to the dryer and the moisture is reduced to 5%. This dryer consists of an iron cylinder 30 ft. long by 30 in. diam.. having an external fire-box, which allows a uniform heating. A car 24 ft. in length and holding six portable steel trays, containing the precipitate, is run in on a track that also extends a like distance outside the shell to allow easy handling of the product. There is a vent at the far upper extremity of the shell to carry off steam, etc., and the entrance is closed with a steel-hinged door. This device has given every satisfaction, being effective and economical.

The precipitate then goes to the mixing-box, where the flux and binder are thoroughly incorporated and pressed into briquettes, which are then ready for the crucible. Only the No. 300 crucible is used, and a unit charge consists of 220 lb. precipitate with its flux. As the briquettes melt down, more are added, until the crucible has its full charge. *There is no dusting.* Four thousand three hundred ounces are refined as a charge and four charges are run in the same crucible within seven and one-half hours. Dip samples are taken.

The briquetting machine is manufactured by the F. W. Braun Co. and is really intended for the manufacture of cupels. But with a square mold and die, 2.5 by 2 by 1.5 in., it makes a clean hard cake and will handle about 100 lb. per hour.

The precipitation-boxes, screening-tank, filter-press, and briquetting-machine are so placed as to allow a solid concrete floor draining to a small pump near the filter. The entire floor is thoroughly washed with a hose every evening and by a simple bye-pass on the suction this water is pumped through the press. The building is of brick, with white plaster walls extending to within four inches of the floor, where there is a cement collar. This makes it easy to detect any carelessness in handling the product.

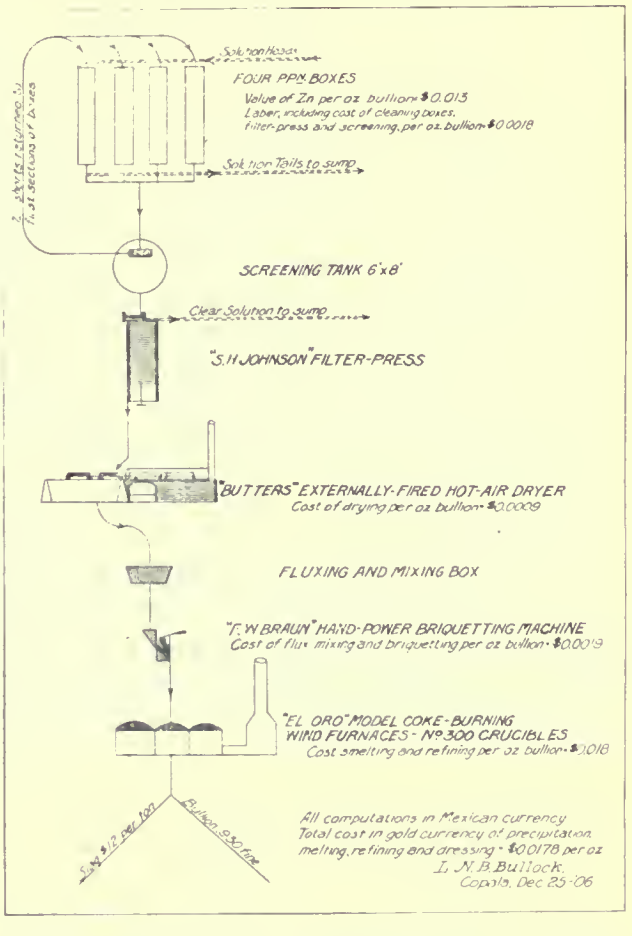
The staff consists of one white foreman and five native boys. On account of the high charges for freighting between Mazatlan and the mines, coke costs us 69 *pesos* per ton; fluxes, zinc, crucibles, etc., are proportionately high, so that taking everything into consideration the cost per ounce is extremely low. We handle on an average about three tons of precipitate per month.

Although this method is far from new, I think there are two or three features of it that are certainly not in general use, namely:

1. Returning all zinc shorts to boxes and thus entirely dispensing with acid treatment.

2. Briquetting product with flux incorporated and smelting same without re-drying (they average 5% moisture).

3. The refining of the bullion in large crucibles, making unit charges of four and five 1,000-oz. bars.


Solution Heads
FOUR PPN. BOXES
Value of Zn per oz. bullion-$0.013
Labor, including cost of cleaning boxes, filter-press and screening, per oz. bullion-$0.0018
Solution Tails to sump
SCREENING TANK 6'x8'
Clear Solution to sump
"S.H JOHNSON" FILTER-PRESS
"BUTTERS" EXTERNALLY-FIRED HOT-AIR DRYER
Cost of drying per oz. bullion-$0.0009
FLUXING AND MIXING BOX
"F. W. BRAUN" HAND-POWER BRIQUETTING MACHINE
Cost of flux mixing and briquetting per oz. bullion-$0.0019
"EL ORO" MODEL COKE-BURNING WIND FURNACES-No 300 CRUCIBLES
Cost smelting and refining per oz. bullion-$.0018
All computations in Mexican currency
Total cost in gold currency of precipitation, melting, refining and dressing-$0.0178 per oz
L. N. B. Bullock.
Copala, Dec 25-'06

The first has been in successful operation for ten months. By first laying, say, two inches of long zinc on the trays of the first section of the precipitation-boxes, then lightly laying the short zinc on top to a depth of 1.5 in. and alternating this until the section is half filled, and finally filling entirely with carefully placed long zinc, we have attained the desired result. All the zinc is consumed and precipitation is perfect.

The briquetting partly does away with the expense of calcining, as the product is dried to only 5% moisture. This product is in every way safer and cleaner to handle and there is no spitting or dusting of the product in the crucibles. The capacity of the latter is likewise greatly increased, unless the comparatively unsafe practice of adding the dry calcined powder to same is followed, which, even when the paper bags are used, allows more or less loss by dusting, etc. In the case of briquettes we add to the crucible without any danger until it is as full as desired.

Mr. Edwin Burt, superintendent of cyaniding for El Oro Mining & Railway Co., Ltd., will bear me out in all of the above, as it was he who first put it into practice

in Mexico, inventiug his own briquetting-machine, a very ingenious device; the above-mentioned company also now briquettes all of its product.

As for No. 3, this means less work and a very large saving in fuel.

I shall finish by saying that the practice here is very satisfactory, the equipment is complete, and the results are certainly economical. It is hoped that you will make use of whatever you see in this short sketch that may prove of value to others, and I shall be glad to read any discussion on the subject.

LAWRENCE N. B. BULLOCK.

Copala, Sinaloa, Mexico, January 12.

[Such contributions from men in practice are of the greatest value; we hope others will 'chip in.'—Editor.]

Sampling and Assaying.

The Editor:

Sir—I would like to ask if any of your readers have had an experience similar to what I am about to describe, and I make the enquiry as much in the interests of those who are examining mines, as in the interests of those who are having their mines examined.

There is a mine not a hundred miles from the Tuolumne river that has been examined by ten experts, among whom are three succeeding managers of a well-known foreign syndicate, two graduates from Pacific Coast universities, one State Senator, and one head assayer for a large Californian mining corporation. Of these ten, five were wise and five foolish; that is to say, five condemned the mine and five recommended it.

Now, as you doubtless know, the usual way for an owner in a case like this is to get up and impeach the motives and ability of those who condemned his property. In this case the representative of the owner, who had been present at every examination, was satisfied that the majority of the experts were entirely honest in their findings and set himself to find a different explanation.

First of all *A* sampled the mine and his results gave between $5 to $6 as an average value for the ore. All *A*'s samples were assayed in duplicate and the mine was re-sampled with the same result.

Next *B* made an examination and his results coincided with *A*'s.

Then *C* came along and only got an average of $3.50 where *A* and *B* had $5 and $6 per ton.

This naturally put *A* on his metal and he went back and sampled over again, with results practically identical to his original findings. He also took one sample and assayed it by five different processes with the result that three gave $5 per ton and two gave only $2. As the half of *C*'s samples had not been taken as a check, however, the trouble was laid to the sampling. At this time several mill-tests were made; these corroborated the assay-results of *A* and *B*.

Next *D* spent six months on the mine, assaying all the time, and his results were the same as those of *A* and *B*.

Then came *E* and *F*; both obtained low results, running about the same as *C*'s. *E*'s samples were assayed by a supposedly good firm of assayers in San Francisco, but they were challenged and a few of them were run by another firm, giving results in every case of 20 to 50% more. *F*'s samples were run by a local assayer, but in this case one-half of all the samples were kept and carefully assayed over again, with the result that where *F* had only been able to get $2.60, the duplicate assay found $5.30 in the ore.

Thus it was demonstrated: (1) That the trouble all along had been in the assaying and not in the sampling. (2) That it was possible for assayers of established reputations, to assay an ore and fail to get all the gold in it. (3) That honest experts sometimes turn down a property through the fault of careless assaying or through the failure to find the assaying process suitable to the particular ore.

The mine referred to is not one of those pockety gold mines that cannot be sampled or assayed. The ore is a silicious slate and carries 7 to 10% iron pyrite whose value when concentrated is from $20 to $45 per ton, and all the values are evenly distributed through the mass. The difference in the results, namely, $3 in a $5 ore, represents the difference between the success and failure in a low-grade proposition.

I shall be glad if you can find space for this and the answers of any of your readers whose experience along the line of sampling and assaying has been similar.

ENQUIRER.

San Francisco, February 23.

[This case is interesting. Our readers are invited to discuss it. Undoubtedly there are some so-called assayers that are impostors, in that they prepare certificates without actually testing the ore, but such scoundrels are rare except in the boom camps. No firm in good standing would play such tricks. It is obviously foolish to send samples to assayers of untried reputation when thoroughly reliable people are available, at the same cost. Whenever it can be proved that an assayer has given returns without assaying the sample, or gives results that demonstrate careless work, the facts should be made known, in order to protect other mining men. In this instance, even with the explicit statement of 'Enquirer,' we fail to understand how so great a difference in the results was possible. It is not possible for a good assayer to "fail to get all the gold" in a sample. That is a fallacy of which abundant use is made by promoters of fake processes—like the Beam, of unlamented memory. Assaying for gold is the easiest kind of assaying to anyone who knows anything about it. We would be sorry to believe that "honest experts turn down a property through a fault of careless assaying, or through the failure to find the assaying process suitable to the particular ore." Honest experts are not so common that we care to think of them being fooled in this way, and, on the whole, we feel assured that such men, being careful in other matters, are careful to choose an assayer known to be trustworthy. In case of doubt, it is easy to send one or two duplicates to another man. As to assaying processes, we repeat that there is no trouble about making a gold assay; when it comes to tin, nickel, cobalt, and other metals less common in the West, the average assayer of a gold camp may be at sea, but in such cases it is obvious that it is best to send the samples to a firm in a big city doing a general business and with varied experience.

The sampling of a low-grade orebody, carrying quartz assaying only between $2 and $5 per ton, is a difficult matter, and, if the ore be patchy, the difficulty is increased. Unless large samples are taken with the utmost care to break a true cross-section of the lode at each place sampled, the results are not trustworthy. In order to ascertain whether the ore is spotty, it is well to divide each original sample into two and reduce each half separately, making two assay samples out of each mine sample. In order to check the assaying, it is essential that the pulp shall be similar and this can only be done by taking the final pulp, pulverized to 100 mesh, and sub-dividing, sending half to one assayer and half to the other. Many discrepancies in assaying are due not to the assayers, but to the actual difference in the content of the samples sent to them, and this is more likely with a free-gold ore than with any other.—Editor.]

Mining in South Africa.—II.

Contributed to the MINING AND SCIENTIFIC PRESS
By J. B. PITCHFORD.

Most of the shafts sunk on the Rand have five compartments. Some are sunk on the dip of the lode which varies from 70 to 35° in different mines, the tendency being for the steeper dips to flatten to about 35° as the mines get deeper. But most of the shafts are vertical. Some new vert cal shafts that have been started for working the deep levels have seven compartments. On the mines of the Consolidated Gold Fields the average rate of sinking eight shafts, each 7 by 28 ft., to depths varying from 1,300 to 3,700 ft., was 100 ft. per month and the average cost $134 per foot. Two of these shafts over 3,000 ft. deep were each sunk at the rate of 152 ft. per month for six consecutive months. The time on the work was subdivided as follows:

Hand-drilling with Kaffirs	3:07 hr.
Hoisting rock	3:26 "
Hoisting men and tools	1:17 "
Blasting	0:50 "
Total	8:00 hr.

Hand-drilled holes per shift	20 to 21
Dynamite per foot, lb.	16 to 18
Coal per shift, lb.	2,400 to 2,800
Buckets of rock (one ton) hoisted	34 to 36

The deepest shaft is the Catlin, about 4,200 ft. The shafts are usually timbered with 8 by 8 in. timbers of pitch pine or Oregon (imported from the States) and lagged with two or three-inch plank. In the hoisting compartments the guides are Oregon pine 4 by 6 in. to 5 by 8 in. Some steel guides are U-shaped; others are T-shaped with extra thick members for the shoes to run on. There are bearer-sets resting on hitches cut in the rock every 100 ft. or less. In some cases steel girders, forming the dividers, are used for bearers.

Each ladder starts from a platform in the pump and electric cable compartments and the mining regulations stipulate that they must all be slanting. They are made of 2 by 4 in. or 3 by 3 in. Oregon pine with round iron or gas-pipe steps about 11 in. apart.

The term head-frame or head-gear is used in preference to gallows frame. For permanent work these range from 75 to over 100 ft. high, measured to the centre of the sheaves. These head-frames are usually provided with bins to separate coarse ore, fine, and waste rock; adjoining them are the crushers and sorting rooms. The crushers are preferably set on an independent framework, so that the vibration will not be imparted to the head-frame. Three methods of sorting are used: The old method of sorting on a floor, revolving steel tables of about 30 ft. diam., and Robins conveying belts. The belt method appears to be the most approved. On a mine having 200 stamps there will be 50 or more negroes (principally young boys) employed at sorting under the direction of one or two white men. Revolving steel trommels are used for washing the ore before it goes on the sorting table or belt. They are about four feet in diameter and 10 to 18 ft. long. The proportion of waste sorted from the ore varies from 10 to 30%. A steel head-frame 100 ft. high with bins, etc., costs $26,000 erected. Automatic self-dumping skips and Templer's shaft equipments are installed on some of the important mines.

On the Rand. Simmer & Jack, No. 2 Shaft.

The ore is conveyed to the mills in various ways. One mine has a railroad and hopper-bottom trucks of 25 tons capacity, and the cost of transport is about three cents per ton. Other railroads pull from two to four ton self-dumping cars at a cost of five to eight cents per ton. The most common method is rope-haulage, which costs from 6 to 12c. per ton. Where the distance is not too great, belt-conveyors are used to advantage.

There are about 7,000 stamps running on the Rand. The largest number in one building is 400 at the joint mill of the Summer East and Knights Deep, and the next largest, at the Simmer & Jack mine, 320 stamps in one building. The mill on the Robinson mine has 220 stamps and three Allis-Chalmers tube-mills. The output from this mine averages $400,000 per month. It has been under the management of W. W. Mein for several years. The crushing capacity of these mills is from five to eight tons per stamp in 24 hours, and it takes seven to

nine tons of water per ton of ore. The weight of the stamps varies from 1,150 to 1,600 lb. The wire screens used vary from 20 to 35 mesh. The coarse screens are used where there are tube-mills. It is customary to install two tube-mills for a 100-stamp mill or three for a 200-stamp mill. The tube-mills are 5 ft. 6 in. diam. by about 20 ft. long inside the silex liners. From 50 to 60% of the gold is recovered by amalgamation; the rest is obtained in the cyanide plant from the concentrate, sand, and slime treatment, except a small quantity that is sent to chlorination works.

Some of the mines use Frue vanners and others use Wilfley tables below the battery amalgamating plates. The product is either sent to the chlorination works or subjected to long-time treatment by cyanide. Shaking amalgamating tables covered with copper plates are used below the tube-mills.

Tailing wheels are used for elevating the sand to the cyanide plant, because the ground is flat. The sand is delivered to spitzkasten where the concentrate is taken out. The material is distributed in the vats by the Butters & Mein's distributor or by direct filling. The concentrate goes to one set of vats and the sand to another set. The concentrate takes about 21 days of treatment and sand about seven days. There are settling-vats and treatment-vats of steel. Classifiers are used for the sand, and the slime-settling vats are provided with an annular launder or trough for leading the water to the return-water reservoir. A solution of cyanide is run through the products and this goes to the precipitation-boxes, where the gold is precipitated on zinc shaving.

The gold and zinc precipitate is then dried, calcined, and melted. The gold-solution is tested on entering and leaving the precipitation-boxes. Filter-presses are becoming more extensively used for slime-treatment. Automatic samplers are employed for sampling the sand. Some of the best methods in the cyanide practice were initiated by Charles Butters, who also supervised the erection of the first large plants.

The most expeditious hoisting done in South Africa is at the Kimberley shaft, of the De Beers mines. Skips holding five tons of blue ground are hoisted 1,840 ft. in 45 seconds, including loading and dumping. The greatest number of winding engines in use in the Transvaal are of the double-cylinder high-pressure type with double drums arranged to run counterbalanced. The steam cylinders range in size from 16 by 36 in. to 28 by 72 in. Some cross-compound hoisting engines are 28 and 50 in. by 72 in. Twin tandem-compound hoisting engines are used on some of the mines and they do excellent work. The Whiting system is used in some instances. A small hoisting engine geared three to one, having two cylinders 13 by 24 in., sunk a shaft to a depth of 3,000 ft., where a record of 203 ft. of sinking was made in one month—the time per trip being 3½ minutes, with a one-ton bucket. The mean effective pressure on the piston of a high-pressure hoisting engine can be estimated to reach 75% of the boiler-pressure. One pound of coal will hoist 30 to 50 ft.-tons of rock with a high-pressure hoisting engine.

Round ropes are almost universally used in the Transvaal. They are usually made with six strands and seven wires to the strand, but sometimes 19 wires to the strand are used where the sheaves are small and great flexibility is desired; and occasionally 13, 14, and 16 wires to the strand. The steel wire is usually from 110 to 140 tons breaking strain. The factor of safety required by the Government mining regulations is six—for all ropes. The comparative breaking strain between crucible steel ropes and plough steel ropes is as 37 is to 48.

The boilers are generally in units of 100 to 250 h.p. and 1,000 to 1,600 h.p. is installed for a mine having a 100-stamp mill. The greatest number are of the water-tube type such as the Sterling, Babcock & Wilcox, and Heine, but there are some Lancashire and horizontal tubular boilers; 800 to 1,600 h.p. of boilers are connected to one chimney by a flue passing around or through economizers. The Weir or Hall compound feed-pumps are generally used. Steam traps are employed extensively. One ton of coal is burned for eight tons of ore mined.

Some of the mines employ the Cornish pumping system. Scarcely any of these pumps exceed 12 in. diam. and 8 ft. stroke. Other mines are equipped with electrically driven pumps, which are more readily adapted to the varying quantities of water in various parts of the mine. Some of these pumps are of the single-acting triple-plunger type driven from motors having reduction gear. Some of the pumps are of the high-pressure centrifugal and turbine type directly connected with the motors. Where strong acid water is encountered lead-lined steel pump-columns are used. Lifts of from 500 to 1,000 ft. are employed with electric pumps and it is rarely safe to exceed 300-ft. lift with the Cornish system; 200,000 to 250,000 gal. per day from a shaft may be near the average on the Rand, but there are one or two shafts that have as much as 2,500,000 gal. per day to contend with. Some of the underground pump stations are 12 by 15 by 25 ft. Armored cables with well insulated and protected wires are used to take the current down the shafts.

The air-compressors are of the compound type ranging from 20 to 75 drills capacity. The principal makers are the Ingersoll Rand, Allis-Chalmers, Reidler, Fraser & Chalmers, and Walker. The rating is based on 100 cu. ft. free air per 3¼-in. Ingersoll rock-drill. The piston speed of the large compressors is from 500 to 550 ft. per minute, and the air-pressure maintained is from 70 to 80 lb. The cubic feet of free air capacity is based on the volumetric intake of the low-pressure cylinder at the rated piston speed.

The rate of drilling is about four to five feet per hour. A 3¼-in. drill takes 12¾ h.p. It takes about 300 lb. coal per ft. for a 5 by 7 drift, exclusive of winding and pumping, estimating the coal to evaporate six pounds water to one pound coal.

Pneumatic hammer-drills are being introduced by Mr. Hellman for stoping. They are very light and can be handled by one man and will do more than six men can do by hand-drilling. There are over 3,000 machine-drills in use in the Johannesburg mines.

Most of the mines generate their own electric power and have two or more generators. Motors are used for the following purposes:

	Kilowatts.
Rockbreakers, sorting tables, etc	70 to 150
Pumping and other work in the cyanide and precipitation house	100 " 180
Returning water from slime dam	20 " 40
Carpenters', smiths', and machine shops	20 " 40
Mine pumping	80 " 150
Lighting underground	10 " 30
Total	290 to 570

At night time, when lights are required on the surface, there will be less motors running than in the daytime; so that for a mine running 200 stamps a fair estimate of the electric power required will be from 500 to 600 kw. unless there is over 250,000 gal. mine water to be pumped per day.

The Consolidated Gold Fields Co. has a central electric plant of about 3,000 kw. that supplies several of their mines. The old Dutch regulation only allowed 3,000 volts to be carried across roads on 24-ft. steel poles weighing 325 to 350 lb. This regulation has been modified

so as to permit of 50,000 volts being transmitted; even this voltage will have to be greatly increased when electric power is brought from the Victoria Falls, a distance of over 600 miles, to Johannesburg, at a cost of several million pounds. The Victoria Falls Power Co. estimates that it can sell the power at a profit for less than it can be generated on a coal mine near Johannesburg, where coal that will evaporate 6 lb. of water per pound of coal can be put in the bunkers for about $2 per ton. As a precaution against accident and to get to business quickly the Victoria Falls Co. proposes to install a good-sized steam-plant near Johannesburg and cheap coal. There are no industries of any magnitude nearer Victoria Falls than Johannesburg, where 50,000 h.p. could be used easily by some of the large mining groups.

Loading a Big Stick of Oregon Pine for Johannesburg; 18 by 18 Inches, 100 Feet Long.

The accompanying illustration shows timbers of Oregon pine, 18 by 18 in. by 100 ft. long, being loaded on railroad cars at Delagoa Bay by the Lingham Timber Co. to be forwarded to the Consolidated Goldfield's mines at Johannesburg. Assuming this lumber to have cost:

In Puget Sound f.o.b. ship	$22.00
The ocean freight to Delagoa Bay was	22.00
The railroad freight to Johannesburg	35.00
Total cost per 1,000 ft. delivered on the mine	$79.00
The value of each timber on the mine would be	$213.30

On account of the high cost of timber, structural steel is now used on the mines at Johannesburg, especially for head-frames and ore-bins.

The compound for the natives is composed of a series of rooms about 14 by 20 ft. arranged in the form of a quadrangle with an open space in the centre. They are built of galvanized iron on wood framing, or brick walls, with galvanized iron roof. The Government regulations require that each native shall have not less than 250 cu. ft. of air. The bunks are made two high and the framework is of angle-iron. The bottom boards are loose, so that they can be taken out for cleaning and disinfecting. The floors are either concrete or asphalt and special natives are detailed to keep these rooms clean. Some compounds are steam-heated and stoves are provided in each room and a coal allowance is dealt out. A separate building is provided for a native hospital. Adequate sanitary arrangements are provided to suit all parts of the mine and surface. The cook-house has a row of cast-iron cooking pots in it. They are about 30 in. diam. and are steam-jacketed. Steam and water-pipes are connected to each pot.

There is a corn-grinding mill where the mealie is ground ready to be cooked into a thick porridge or mush. This is stirred by the cooks and dished out to the natives as they file past. Vegetables are also boiled and each Kaffir is allowed about two pounds of meat per week and some bread. The Chinese are fed chiefly on rice and stewed meat, with vegetables and bread, and are allowed all the tea they want to drink. They are quartered in a separate compound.

Hundreds of diamond-drill holes have been sunk on the Rand and in the adjoining districts for the purpose of prospecting for gold and coal. Some of the deepest holes have exceeded 5,000 ft. The formation is not badly broken, being sandstone, shale, quartzite, and porphyry. It is possible to obtain over 90% of the core for examination.

Some of the very deep holes in Africa have deflected to a considerable extent, especially those sunk on inclines of 45° or over. In nearly every case the deviation was to the right or the direction in which the drill revolves. The deviations were usually surveyed by the photographic method, by the hydrofluoric acid method, or by H. F. Marriott's instrument. These methods have been tried on the same hole and they have checked each

other closely. The diamond-drilling machines used are the Sullivan and Bullock, the former for the deepest holes.

One of the most difficult diamond-drill holes was started at the bottom of a shaft full of water, the shaft being 2,520 ft. deep at the time. A hole was successfully drilled over 500 ft. below the bottom of the shaft and a lode, assaying $10 over a good stoping width, was cut. The Vogelstruis West shaft was afterward pumped out and sunk. The correctness of the diamond-drill work was then proved.

The railroads to Johannesburg are:

From Cape Town	1,000 miles
" Port Elizabeth	700 "
" East London	660 "
" Durban	480 "
" Delagoa Bay	400 "

The best natural harbor is at Delagoa Bay, but this is in Portuguese territory, which supplies half the negroes working in the mines. The gauge of the Central South African railroads is 3 ft. 6 in. and considerable 80-lb. rail is used. Narrow-gauge railroads are a mistake for long-distance hauls when it is considered that the proportion of weight of rolling stock to load is greater than on broad gauges. The running time on a narrow-gauge road cannot be as fast as a broad gauge with the same degree of safety. The road-bed is fairly well constructed and the most important bridges are good steel structures. The running time is slow compared with English railroads.

The rolling stock is generally good. The sleeping cars have a corridor down the side and the dining cars are on the American plan, but all are somewhat smaller on account of the narrow gauge. Some of the hopper-bottom steel coal-cars carry 35 tons. The rates of transport for merchandise and coal per ton mile is about five times as much as in the United States. Coal that costs $1.50 per ton at the pit's mouth costs from $2.25 to $5 delivered at the gold mines, the distance varying from 30 to 120 miles. Transvaal coal will evaporate 5½ to 7½ lb. water per pound of coal. Most of the heavy machinery imported comes by way of Durban and Delagoa Bay, and Oregon pine sticks 18 by 18 in. by 100 ft. have been hauled by rail from the latter place. All Oregon pine comes from Puget Sound and pitch pine from Georgia. Most of the foodstuffs are imported to Johannesburg from other countries and this, together with the machinery and building materials, makes a big business for the railroads.

The railroads are controlled by the Government and the rapid development of this vast country is consequently retarded because the scope for individual enterprise is eliminated from more numerous schemes than any set of Government officials could find time to attend to, even if they had means at their disposal. The Government has no right to risk the people's money in a railroad gamble, but individuals have the right to gamble in railroad building if they see fit, as long as it is not taxpayer's money. All these conditions tend to the slow development of a country whose resources are scattered over a large area. The business done by the railroads to the mines has been immense. The item of machinery alone amounts to over $55,000,000, including cost and transport.

There are a number of coal mines within a distance of from 20 to 130 miles from the gold mines and their annual output is about fourteen million tons.

There are a number of diamond deposits in South Africa. The two large producing mines are the De Beers at Kimberley, whose output in 1906 was 2,211,000 carats, realizing $26,300,000. There are 22,000 natives and 3,700 white people employed by this company. Diamonds have more than doubled in value in eight years. The other large diamond mine is the Premier. It is in the Transvaal near Pretoria. The Cullinan diamond (the largest in the world, 3,000 carats, value over $2,000,000) was found here. The output for 1906 was 1,049,800 carats; 60% of the net output goes to the Government. Dividends were paid amounting to $1,500,000 per annum.

The natives are the happiest and most independent people in the world. When they are discharged, they do not worry at all. They can earn enough in a month or two to keep them a year and they easily acquire extravagant and some other bad habits by contact with white people. A negro who has been all his life with his own people is much more useful for work and far less tricky than one who has had the white man's religion held up to him. It is impudent presumption for white people to pretend to teach African natives morality, for, taken as a whole, they are more moral than large communities of the white civilized races. Some of the tribes used to punish immoral acts by death.

As a rule, the natives are generous and kind to each other and there is little bloodshed among those of the same tribe, but some tribes hate each other by tradition, and if they get to fighting they are vicious. In the compounds on the mines the negroes of different tribes have separate rooms and there is seldom any quarreling unless they get too much drink. The natives employed on a mine only lose about six per cent of their time through drink, sickness, and all other causes, which will bear comparison with white laboring people.

There is enough low-grade ore in the Transvaal to produce $10,000,000 per month that will not pay high enough wages for white labor. Must it stay in the ground? There are millions of colored people in the world that have been raising rice, tea, coffee, sugar, tobacco, and doing other kinds of menial work for thousands of years. The more highly civilized races have received and still continue to receive the benefit of this work. The natives of Africa and others who desire employment that will not pay white people should have the opportunity to take out this enormous wealth, nine-tenths of which would be paid out for machinery, supplies, and labor; and the supervision would give employment to a number of white people.

South Africa is not a good agricultural country and will never be a rich country except for the gold and other minerals and precious stones taken from the mines. The rivers are inadequate for irrigation except for a small portion of the vast land area. There are practically no ranges of snow-capped mountains making rivulets to flow to the valleys. The rain-fall is about 20 to 30 in. and the evaporation from lakes and reservoirs exceeds five feet in a period of nine months. A large amount of the land is either rocky or sandy. Retaining reservoirs for irrigating purposes require to be of an immense size in proportion to the land irrigated, and large catchment areas are necessary. One acre of grazing land in the United States is equal to five acres in South Africa. Wells for irrigation are being bored by Americans in the Orange River Colony, but the farmers only cultivate a portion of their land and are glad to obtain sufficient water for their cattle and sheep.

DROP-HAMMERS, operated on the principle of the pile-driver, are used in the Lake Superior region for breaking large lumps of ore, and cleaning mass-copper preparatory to smelting.

THE erosive power of water, or its power of overcoming cohesion, varies as the square of the velocity of the current.

Silver-Lead Smelting Practice.—II.

By T. S. Austin.

Edited for the Mining and Scientific Press
By L. S. Austin.

Operation of the Furnace.—[In a letter of August, 26, 1888, he says:] Most of my furnace running is done by eye, and one should acquire this faculty. I maintain that it is quite as necessary as the analysis. Analysis is all right when you have good reduction and a slag near the type in the three elements, otherwise you have to trust to appearance in the pot, action in the furnace, crystalization, etc. I would not lower the silica unless the slag showed very acid.

The mechanical and physical part of silver-lead smelting is fully as important as the slag composition. You may have often noticed that slags, very far from correct, have given excellent results in every way, while correct composition is no surety of excellent work. Thus a 'hasher' [one who smelts by guess] may at times get excellent results, unfortunately, for him, without knowing why.

Quantity of Fuel.—Here lies the secret [in connection with the blast] of successful smelting.

Not enough attention is paid by metallurgists to this important factor. I know that formerly I never used to. A certain amount of fuel was always used, often so many scoops-full. The slag, when it came down, often was different from the calculation, then there came the doctoring of the slag with iron or lime to get it right, and that perhaps would be futile. I have seen S—— run a week on an unreduced slag, trying to flux it right, often adding silica to get it acid because it looked fluid, when a good dose of coke would have brought it round inside of 24 hours. Over-reduction is as bad, for it will bring on sows, and make speiss of all the arsenic in your ore. It will give copper sows and crucible trouble without rest. I always weigh my fuel for each furnace. When putting on a new charge, I add a little more coke than might be necessary, so as to be sure to have the slag reduced, for, until it is reduced, you can form no definite opinion of what it truly is. After the charge is down I have my analyses, assays, and physical appearances to guide me, also the working of the furnace. If the slags are under 0.7% I take it that reduction is enough, if 0.3 to 0.4% I know I am verging on over-reduction, for, with too much coke the speed will lessen, and there will be coke at the tap-hole, and tendency to over-fire above the top of the charge. I consider 1% lead in the slag too much, as it tends to greater lead-loss, especially if you run much refuse or foul slag, but it certainly makes pretty running for speed on any slag of fair composition. In reducing fuel, a cut of 1% in the weight of the charge is enough where you are running fair. In going the other way, say where the slag is as high as 2% Pb, I would add much more, say 4% and, when reduction *does* come, it is possble to cut the excess by degrees. Nine times out of ten you will find that when the reduction takes place the slag composition is off. Silica will be high and FeO too low. After the slag is corrected, then you can commence reducing the amount of fuel to suit.

The fuel should be regulated so as to keep the lead assays from 0.5 to 1.0%, but anything that tends to over-reduction is as objectionable as under-reduction. With over-reduction both iron and copper sows will result, and the surplus of fuel, which has to be consumed, slows down the furnace, as well as making crucible-trouble. Your lead assays of slag and matte are guides here. The slag with 0.5% lead I do not consider too low for the proper amount of reduction, while the matte should carry 12 to 15% lead. You will notice when you have poor reduction, with slag from 1.5 to 3% lead, that you will have to very largely increase the fuel-charge to get the furnaces back into a normal working condition. Of course, this is to be done only on those furnaces that are working badly at the time of non-reduction. I notice that furnaces that have been in blast for some time, are more prone to these irregularities.

Amount of Blast.—This important factor goes hand-in-hand with the fuel. It will vary with the state of the furnace, size, or coarseness of the ore, etc. Still it is best to keep the blast constant, and regulate other conditions to it. If reduction is imperfect, a slight slackening of the pressure will often help it. This is because the diminution of blast-pressure retards the furnace-speed, the coke burned per minute is lessened, and more time is given to ore reduction. On the other hand, with slight over-reduction, increase of blast is a good thing, as it gives speed, and the ore is exposed for a shorter time to reducing influences. It is hard to fix the blast-pressure one should adopt, but I believe 18 oz. is a maximum (with a 12 to 14 ft. smelting column) for the ordinary lead furnace. Generally 15 oz. will give all that can be desired on average coarse ore. Speed can be got at that pressure by cutting down rather than by raising blast. I would say drive all you can up to the point of hot-top, but avoid that objectionable feature always. Of course, the more you get smelted in a day the cheaper you are smelting, and never lose sight of that fact. Aim to get your charge coarse by getting lumpy ores, then regulate your fuel so that you use just enough for smelting purposes, burning no unnecessary excess. Under these conditions use blast enough to speed the furnaces up to the capacity of your men, and just short of having a hot-top. You will find, though, with a good state of affairs at the tuyeres, the heat will confine itself to this zone where it is needed, and you will reach the limit of endurance of your men before you get over-fire. I have found that over-fire occurs mostly with slow driving with fine ore.

Mechanical Condition of the Charge.—Fine ore we know is a bad thing. It causes slow running, liability to raw ore at the tuyeres, irregularities, higher silver losses. If you can fuse or even frit it, it is, in most cases, commercially advantageous, as you convert your slow-running material into fast-running material, and decrease the cost of smelting by increasing tonnage. Your fused product takes less fuel to smelt, and gives a cleaner slag. On the other hand fusing loses more lead and silver, so that you might find it better to frit only, especially where you are not crowded with ore.

Condition of Furnace-Shaft.—With a shaft much incrusted, the furnace is subject to sudden variations, and is liable to get off in reduction. Still, by slower running, more fuel, lighter blast, one can do very good work with a badly crusted furnace. It is better economy to bar it off than to continue to run it under such conditions. I always do my barring by blowing out completely. Then, when the furnace is cool, I have it cut down by gads, and have a good job made of it. This is also a good time for general slight repairs.

Collecting Agents.—Lead, iron matte, and copper matte are all good collecting agents. I consider the latter particularly so, consequently if you have a good deal of it, you can run with less fear of silver loss, although you

*These observations of T. S. Austin, recently deceased, general superintendent of the Southern Department of the American Smelting & Refining Co., are compiled from letters written by him to his brother, from 1883 to 1906, covering most of the period of his wide experience in silver-lead smelting, and to some extent that in base-bullion refining. They lack some of his recent experiences, but show that much of his knowledge had been brought into finished form some time before his death. The notes refer largely to his work at Socorro, New Mexico, Monterey and Chihuahua, Mexico, and to El Paso, Texas, together with other technical observations made during that time. Professor L. S. Austin's remarks are in brackets. The first of this series appeared in our issue of February 23.

will be liable to crucibl-etrouble from copper sponge. A good percentage of lead on the charge is a valuable thing, and finally I think the association of lead and silver together in the ore has much to do with clean silver slags.

FURNACE OPERATIONS AT MONTERREY, 1893.—I notice that you have the conditions favoring good blast-furnace work in silver-lead smelting, namely, a good percentage of lead on the charge (over 10%), the presence of copper, roasted material in the charge, and silver and lead associated in the same ore. Here (at Monterrey) I have as a rule no copper, lead 10% of the charge, and with the lead ores nearly silver-free, and the silver ores quartzy and containing but little lead. The result is that it is hard to get and keep a slag properly clean in silver, and unless I run slowly, without forcing the blast, the slag will go right up in that metal. I run a slag of the three-quarter type, but with the CaO largely replaced by ZnO and Al_2O_3, so that I get one of 33% SiO_2, 33% FeO, and 17% CaO; but, unless I am very careful, I get high silver on any approximation to this type. I simply have to avoid high blast and driving, and allow the lead enough time to act fully on the silver compounds. I could never run the blast as you do to 28 oz. and be successful with my slag. My conditions here are indeed peculiar, and, try as I will to overcome the defects, I don't feel successful in doing so. The furnaces are good-running, I have long campaigns, good crucibles, cool tops; everything in fact, save low silvers in the slags, and that is something that defies me. I shall work things round in time, so as to get better ores, or rather, suitable ones, and with the advent of roasting and of copper will come cleaner work.

My opinion is that fast running tends to increase the silver in the slag under certain circumstances, and these circumstances are when the silver and the lead are not allied in the minerals that compose the smelting mixture, that is, if the silver is in a silicious ore on the one side, and the lead in a low-grade carbonate on the other, fast running will induce high-silver slags, because the lead and silver will not have time to come into intimate contact and mixture. If, however, the silver is in a mineral together with lead, as an argentiferous galena, or with lead and copper as gray copper ore (tetrahedrite), or even as a sulphide with other base sulphides, it will be taken up by the lead much more rapidly, and faster running will be permissible. One can readily conceive of a condition of affairs when almost any speed, within reason, would not seriously affect silver-loss in the slag. Thus the lead ores might be largely good-grade argentiferous galena and carbonate mixtures, the silver ores medium or even high-grade quartz ores carrying the silver associated with lead, copper, and iron sulphides. Considerable quantities of roast-product, fused or sintered, might also be attainable, and roasted matte, containing copper, be largely used. In such a case everything, so far as silver is concerned, would be right for fast running, and it should be "a consummation devoutly to be wished." Still 120 tons per day is good big tonnage for a furnace (42 by 120 in.) anywhere, though I think, if the men could stand it, you might do even better. This is my view on the silver question.

As regards lead I hold that one may take an altogether different attitude. The slag assay does not tell the losses. Of course, reduction may be very bad, and the slag-loss will be heavy, and it will be shown at once in the output of base-bullion. This outrageous loss is seen at a glance and almost without the need of an assay. I think you must carry the lead as high as one per cent in the slag to get continued fast running, and aim to avoid over-reduction. Indeed it is here that the metallurgist's judgment and skill come in "the running on the ragged edge." However, if he runs in this way, and the furnace speeds right along, the fume-loss will be minimized and the monthly statement will show less lead-loss than was the case with slow running and low assays of lead in the slag. It is a case of daily care and management. The three conditions are as follows:

1. *Ideal Working.* The slag assay gives medium results for lead, say 1 to 1.2%, the slag is fluid and hot, the speed of the furnace high, the smoke or fume escaping at the throat, light in volume, color gray or dark, base-bullion output good.

2. *Under-Reduction.* The slag is higher in lead, say 1.2 up to 2 or even 3% or more, the slag fluid but cold and red, looking heavy, the speed very high, the smoke thick and much in volume, with a grayish-white color, the base-bullion output bad. To correct this condition there is needed extra fuel, scrap iron, or some other reducing agent, and even a moderate lowering of blast.

3. *Over-Reduction.* The slag is low in lead, say only a few tenths per cent, the speed much reduced and the furnace tightening, the slag slow-running but hot, the furnace-top hot with white smoke when the fire mounts to near the surface, and very little at all when it is quenched back. The base-bullion output is good, but the crucible is liable to get sticky. This condition is to be corrected by cutting down the fuel.

These conditions you have doubtless met and you are aware that they are the main rules for handling a furnace. With high speed there should also be but little trouble in keeping the fore-hearth or settler open and in good condition, especially if you have much matte.

In investigating the furnace operation one should in particular obtain the following data: Blast pressure in inches of mercury, the name or make of blower, its size or number, displacement per revolution and the number of revolutions per minute, and, if possible, the horse-power needed to drive it. This last may be obtained by indicating the engine, both with or without the blower, or, if run by motor, even more easily by readings of the ammeter and volt-meter. The level of the charge should also be given, whether kept to the level of the charge-plate, or with the charge dropped down a bit, the smelting column (distance from tuyeres to charge-plate), the section of the furnace at the tuyeres and above, the nature (degree of fineness) of the charge, the amount of foul slag returned to the furnace, and the kind of slag (as given by analysis) made. The percentage of fuel is to be specified, based upon the weight of the charge, and it must be understood what this charge is, that is, whether or not the foul slag is included, and whether the weights are the dry or the wet weights, and what amount of roasted material is used. The tonnage of the furnace should be given, and it is well to know how the jackets hold out and whether other construction is satisfactory.

EDITORS stand for what is thought and sought. Publishers stand for what is blazoned and bought. Editors represent the abstract. Publishers represent the concrete. Editors interpret the public will. Publishers guard the office till. Editors speak for and to the race. Publishers are concerned with pace and space. The lines of editors go throughout all the earth and their words to the ends of the world. The lines of publishers are agate, nonpareil, or minion, with special terms for displays or cuts. Sometimes publishers disguise advertisements as reading matter. Their wickedness, however, is discovered and, though they may not be condemned, editors are never found guilty.—St. Clair McKelway.

Pockets in the Upper Portion of Gold Veins.

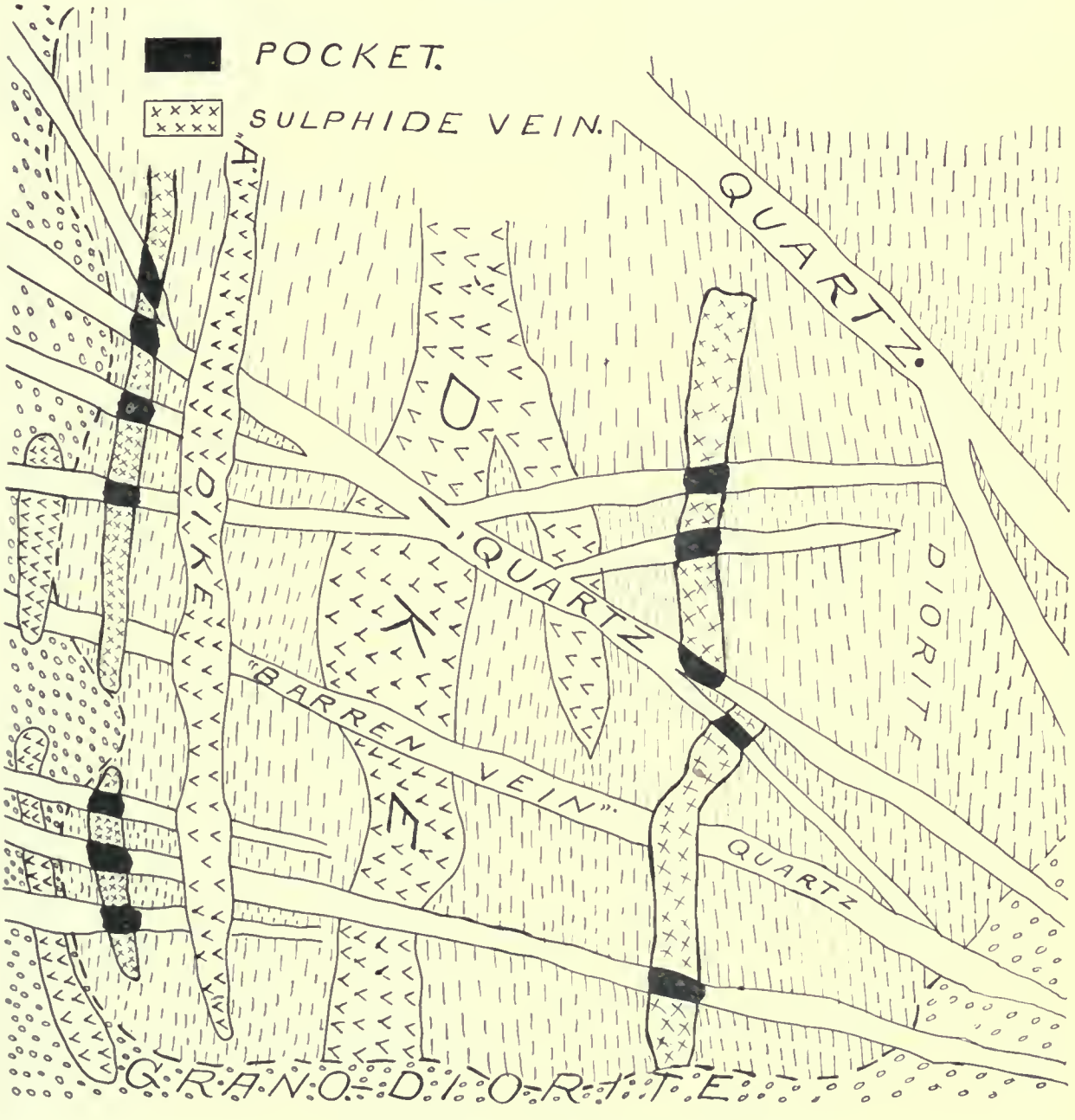
Written for the MINING AND SCIENTIFIC PRESS
By GEORGE W. KIMBLE.

The theory of secondary enrichment has been generally accepted as the process by which the pockets or bonanzas in gold veins have been formed. To support this theory, many persons have written descriptions of occurrences of ore that have been extracted under their management or examined by them. The writer, having been prevailed upon to contribute a description of some of the pockets taken out by him, offers the following in the interests of science, with the hope that others may give their experience in this kind of ore deposits.

The accompanying sketch is a geological plan of about forty acres, covering a strip at the eastern base and a portion of the slope of Mt. Thompson, in Eldorado county, California. The quartz veins and their enclosing rocks are clearly indicated.

The surface soil was of a dark red color and a clayey nature, varying in depth from one to six feet, consisting mainly of angular gravel and small boulders of the underlying bedrock. A large portion of the surface of the hillside and the beds of two ravines within this area had been washed away by the early placer miners, who obtained large quantities of rough or 'seraggy' gold. This gold was intermixed with particles of quartz, accompanied by the rare mineral, roscoelite, all being usually coated with a black or dark-brown oxide of iron.

On the east and north of the tract described there is a large area of grano-diorite, while the greater part included in the sketch is but a small portion of a large area of normal and very much altered diorite, diabase, and porphyrites, traversed by many quartz veins, which vary in size from a fraction of an inch to several feet.



Geological Plan of 40 Acres on Mt. Thompson, California.

At two points on the western edge of the grano-diorite, there is an outcrop of a dike averaging six feet wide, composed of a greenish colored rock, that contains many microscopical crystals of feldspar and hornblende. This dike is much fractured by shrinkage and compression. The porphyrites appear as dikes in the diorite, and have many off-shoots or spurs at various angles with the main dikes.

The diorite in contact with these dikes is altered to a dark-colored bluish micaceous rock, the gradual transition from the normal to the altered rock being discernible at many places. The diorite and the porphyrites are extensively fractured by horizontal, vertical, and dip

joints. The dip of the formation is from 50 to 70° east.

The quartz veins are shown in the sketch. Those that continue as far as the grano-diorite extend into it for a distance proportionate to their size. The strike of the smaller veins is at such an angle with that of the larger ones that they intersect the latter within the diorite and porphyrite area. The larger veins have a uniform dip, about 70° southwest, while the smaller ones dip in the same direction with a dip varying from 40 to 60 degrees.

In the sketch, *A* is a granular feldspathic dike about eight feet wide that must be younger than the quartz veins, as it slightly faults them in their strike where it crosses. There are two sulphide veins within the area that have a strike nearly at right angles to the quartz veins. These sulphide veins are nearly vertical. The small one varies from a fraction of an inch to about four inches; the larger is as much as four feet wide in places. Both veins are thoroughly oxidized from the surface to various depths, the oxidized portions having a black, a dark-brown, or a yellowish color. All the quartz veins except one cross the sulphide veins at their intersection, the latter being faulted from a few inches to 27 ft. at the surface. In the exception noted, the sulphide vein crossed the quartz at their intersection and faulted the latter about one foot at the surface.

The pockets occurred only at the intersection of the sulphide and quartz veins, and only where the latter crossed or cut through the former. In the cases where the sulphide vein crossed the quartz, or where the sulphide did not come into actual contact with the quartz; that is to say, if there was a mere film of any other rock between the quartz and the sulphide, there was no pocket. The pockets varied in value, some containing only a few dollars' worth of gold, others producing thousands of dollars. The quartz was very rich, a candle-box full of specimens yielding a thousand dollars or more. Some of the larger pockets contained chunks of solid gold weighing several pounds. The pockets consisted of gold, roscoelite, tellurides, and iron pyrite in quartz and calcite. The quartz was sometimes transparent and nearly colorless, sometimes amethystine. The larger portion of the gold would be found in the quartz at its intersection with the sulphide vein, the quantity gradually decreasing in all directions. At a distance of a few inches from the centre of the pockets, the quartz became absolutely barren. The smaller quartz veins contained but one pocket in depth, while the larger veins contained several, which were, on an average, about six feet apart on the dip of the vein. In these large veins the portion between the pockets would always yield a good showing of free gold by panning the decomposed material between the walls, notwithstanding the fact that the solid quartz would not yield a trace.

The sulphide veins were largest at the pockets and contained no country rock, nor did they contain any gold except immediately at their contact with a pocket. All the quartz veins gradually pinch out or else split into numerous thread-like stringers as soon as there is no more evidence of oxidation.

Within the area included in the sketch, it was demonstrated that wherever, in the language of the pocket miner, "an iron seam," be it ever so small, "intersected a seam of quartz, there would be a pocket." But it was also demonstrated that it is absolutely necessary, in order to make the pocket, that the quartz "*cut across* the iron seam." In this formation it was evident that there were three sets of fissures, which were of as many different ages. The first was the single fissure now filled with barren quartz. The second were what are now the sulphide veins, which are excellent examples of the replacement type. These second fissures cut across the first one—the single vein mentioned. The third fissures were what are now the quartz veins containing the pockets, which crossed and faulted those of the second period. It is noticeable that the faulting was considerable at what is now the surface and died out below the line of any decomposition.

It is very evident that the larger quartz veins continue much deeper at some distance each way on their strikes from the point where the pockets occurred. It was demonstrated that there were no pockets at the intersection of quartz with quartz. It was my opinion at the time that I worked these pockets, or bonanza deposits, that they were formed by descending, instead of ascending, waters, and that the sulphide veins influenced the deposition of the great masses of gold at their intersection with the quartz veins.

A Remarkable Lease.

The Hayes-Monnette lease on the Mohawk mine at Goldfield expired in January, and Mr. M. J. Monnette told the story of his enterprise to the *Goldfield News*, as follows:

Four million, four hundred thousand dollars is the production. This includes the settlements already made, the fifty carloads now in transit, and the five or six carloads that remain on the dump, and which will be shipped within the next few days. Messrs. Hayes & Monnette are removing the hoist from the property to the Goldfield Columbia, which they will operate on an extensive scale. The lease goes on record as the most profitable of its kind in the history of the world, not only in the amount of wealth it realized for its owners, but for what it did to bring a great mining camp into the prominence it deserved.

This lease does not have the number thirteen figuring in it to any great extent, but it is remarkable that work on it was begun, ore was struck, and work was concluded on a Friday. The four owners, G. H. Hayes, M. J. Monnette, J. W. Smith, and Harry Benedic, are each about $900,000 richer as the result of their venture. Another month, even a week, would have enabled them to pass the five million dollar mark in production, for when the lease expired and the ground reverted to the Mohawk people there was at least one million dollars' worth of ore blocked out and awaiting the breaking and hoisting that could have been so easily accomplished with the splendid equipment of the property under the direction of Superintendent Runnels. The lease was originally 373 by 700 ft.; two-thirds of this area was sold to other lessees, none of which was highly productive.

Mr. Monnette says that the greatest production of the lease in any one day was $60,000, and the highest assay was better than $100,000 per ton. This was exclusive of a selected piece that ran better than a quarter of a million dollars. The greatest production for any one month was $1,300,000 in October. The ore averaged $400 in the car. Nearly all the production was through No. 1 shaft. No fatalities occurred during the life of the lease, the worst accident being the loss of a portion of a finger. For several months an average of 130 miners were employed.

THE recession of the Niagara falls is a matter of recent geological history. It did not begin until after the third great glacial retreat, as the drainage of the Great Lakes had not been through the St. Lawrence previous to that, and the time required for the river to eat out the gorge from Lake Ontario to the present position of the falls, was only about 70,000 years.

Notes on Mexican Mine Labor.

Written for the MINING AND SCIENTIFIC PRESS
By CARL A. ALLEN.

Although there have been few articles on the Mexican laborer recently, they were at one time not infrequent, and those articles and various conversations that I have had with mining men lead me to believe that there has been and yet is a prevailing impression that, while the wages of the Mexican miner are low, still, owing to his alleged lack of industry and mining ability, his work is expensive. Some phrasemaker once said: "Cheap labor means dear work," and this principle, while doubtless true, is too often unthinkingly applied. Cheap labor is expensive, but the question of cheapness is merely a local one. Because an American miner gets $3.50 per day gold and a Mexican gets $2 per day silver, it by no means follows that the Mexican is getting low wages. It is forgotten that one dollar spent in the United States does not mean that it is equal to the expenditure of 4s. 2d. in England, or two *pesos* in Mexico. Two silver dollars in Mexico will buy more of the necessaries of life than one dollar in gold in the United States, although the legal difference is only about two *centavos*. Hence to give a Mexican miner the absolute equivalent of the wages of an American miner would be to overpay him. The fact is that 'cheap,' in the phrase quoted, simply means cheap at the place of production, and in this sense cheap and poor are synonymous.

Depreciation of Mexican labor by American laborers often comes from a misplaced pride of race on the part of the latter, but the Mexican at $1 is a man *far* more to be preferred than the Slav, Pole, or Finn at $3; and, on the whole, as good, if not a better man for the money than the so-called American miner, as he is found today.

On looking into the systems now in vogue of employing the Mexican, we find him usually working on a contract, where he is paid by foot of advance, or by '*cuete*,' as it is called, or else he is being paid by foot of hole drilled; that is speaking of the *barreteros*, or drillers; the *peones* or shovelers, and other unskilled laborers being paid by the day. The object is that of all contracts, namely, to pay only for results obtained, and so far has this contract system been carried out by Americans operating in Mexico that I have even known them to pay so much per set for putting in timbers. This usually works so favorably to the men that, when a new company would commence operations, a man would not ask just for work, but for a contract for anything from bringing in a stray mule to driving a tunnel.

Some of the disadvantages of the *cuele* system are as follows: If the vein is hard, it will be avoided and although apparently not important, the famous old Las Yedras silver mine stands as an example of where the ore (in a wide vein) was entirely lost in some of the lower levels, due to the necessity of paying by *cuete*. The miner will demand the right to point his holes as he wishes, with the result that they will not be placed in a manner to break well, and leave a good floor. Again, by contract, after a short time the work is pretty liable to go slow, it being my experience that generally speaking, more than two Mexicans cannot long work peaceably together, but will quarrel and not hesitate to shirk responsibility for poor work, each on the other. Another disadvantage of letting contracts is one well known to superintendents of leasing mines in the United States, that is, the liability of the contractor to bring in a class of men detrimental to the order of the camp, men that may have been blacklisted by the company itself. Lastly, I would mention a very important fact noted from experience, and that is that a man working by contract and receiving his pay in larger amounts is a poor customer at the company store, but will go off to some near-by town to show the people how prosperous he is, even though prices are higher.

The second method mentioned, or paying by foot of hole drilled, is, to me, far to be preferred; but the following disadvantages are worth considering: The holes will be placed so that they may be hit to the best advantage and where the ground is softest, which may mean that they will break the least ground and the advance of the work will be small for the number of feet or holes drilled. In order for the holes to be properly placed and pointed, the foreman will have to be on hand to see every hole started, or else have a *pobladot*, or blasting boss—a gentleman, usually a Mexican, who by showing partiality and not being around to measure holes when finished, etc., becomes a veritable nuisance.

The second point is, that there is sure to be a segregation of the best men, from the medium and poor *barreteros*, that is, a good man will not work with an ordinary man, but wants the best partner, thus leaving a class of men who, by themselves, cannot do much skillful work, but being good hammersmen, with a good man, would make efficient *barreteros*.

The objection always raised to day's pay is that it is impossible to get the work out of the men. I readily admit that the Mexican will not make as much effort by day's pay as by contract, but I do claim that he will not be contented if his contract rate is not such that by working at the same speed as he would by day's pay, he could earn the amount paid to day's pay men. To illustrate how these conditions work, let me cite the following example: In a certain mine, the men drilling by foot were making three *pesos* per day each, at 25 *centavos* per foot, that is, making an average of 24 ft. per day. In another mine, where the men were working by day's pay, they were drilling 16 ft. of holes for two pesos per day each (all double-hand work), which is the same rate. The day's pay men were putting their holes in *right* and were making very nearly the same footage with a labor bill of eight *pesos*, as their neighbors were on a labor bill of 12 *pesos* daily, both working two shifts; moreover the day's pay men could be changed at any time to any part of the mine at any kind of work, in itself a fact not unimportant.

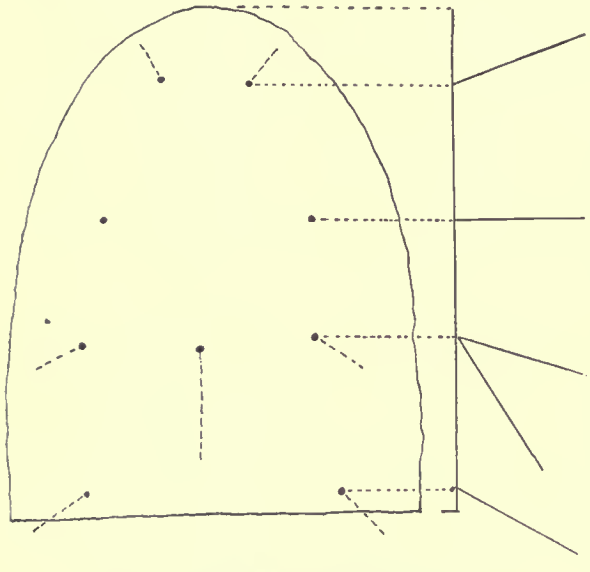
As to how to get the most out of the Mexican when working by the day, I suppose that every man has his own way. Although it requires a great deal of patience, it has been my experience, and also some of the best engineers with whom I have talked in this part of Mexico, that the people as a whole are far more responsive to kind firmness, than to harshness or abuse. In fact, I have never seen any people so amenable to a kind rebuke as the Mexican, as he is found well south from the border.

Having tried to show that, with a little care, the Mexican *barretero* can be worked in most cases to a better advantage as a day's pay man, let us notice an important commercial reason for this method. A good many operators look at the question from the viewpoint that as you don't have to pay much to each Mexican, place all the men in the mine that you possibly can, and get the work done by numbers and not by efficiency. This is not economical, and worse yet, does not serve to educate the men in the business, which is vitally important for the following reason: In the region with which I am most familiar, that is from Fuerte on the west, to Parral on the east, and from Batopilas on the north to San Jose de Gracia on the south, and I also think of many other parts of Mexico, the labor demand will soon become greater than the supply, therefore it is vitally important to train the Mexican so that each man can do more work, and in no way can this be done as well as by day's pay,

and it can be done well that way. The miner can quickly be taught to point his holes right and not be all day charging them, as is often the case now. I have seen the breasts being broken just as square in Mexico as in the States, and with only a few months of experience on the part of the miners.

Now, in closing, let us just look at a few things, comparing the Mexican miner with the American miner. First, there is at the present time less disturbance in the Mexican camps than in those of the United States. The recent trouble at Cananea, I understand from a letter from a man on the ground, was caused by agitators from the States, and although improperly handled Mexicans are very liable to disturbance, properly handled men are inclined to remain orderly. The same thing may be said of the regularity with which the men work, for I have noted that they work nearly as regularly as the miners that I have worked with in Colorado.

The American will be paid $2.50 to $3.50 per day, gold, the Mexican two *pesos*, or 98 cents gold, say $1. Exclud-



Sketch Showing Method of Placing Holes.

ing timbering, a good American miner will not perform more work than two Mexicans, nor as much. He may do it in ground where every advantage may be taken of slips, but, on the other hand, he will certainly not do much more than equal him in rock not especially difficult to break and where the Mexican can be given a general system of placing his holes. For instance, I was driving three drifts 6½ ft. high by 4½ ft. wide at the bottom, in ground hard to drill but very easy to break. After trying several methods of having the holes placed, I finally adopted the method illustrated in the accompanying sketch, which worked advantageously. The men liked it and quickly learned to change the number of holes to suit ordinary changes in the rock, keeping the floor smooth and of proper grade and the breast square. The holes all hit well and in one of the drifts where I kept notes the men were breaking 2¼ to 2½ ft. every round of holes, and when requiring the *barreteros* to clean back from the face they averaged 3½ ft. per day and went some times over four feet in a day where the total labor cost, including the *peon*, was 9.50 *pesos*, or $1.75.

Another advantage is that the Mexican is not paid in cash if, at a little trouble, a store is provided at the mine, and this is necessary, as otherwise the men will be leaving work every few days to go and purchase from other stores, often a day's journey on the trail. Ordinarily the men will take from 75 to 95 per cent of their wages out in goods on which, selling at the usual prices, 50 per cent profit is made. If then he earns $1, he will be paid 25 cents in cash and 75 cents in the shape of 50 cents' worth of goods, that is, he has cost 75 cents for the day, just about one-fourth of what would be paid to an American miner.

For these reasons, I believe the labor condition affords a great advantage to cheap mining in Mexico.

Depth of Death Valley.

The United States Geological Survey has just completed a line of spirit levels through Death Valley, California, and much to the surprise of everyone familiar with the region has ascertained that the depth of that area is not so great as was supposed. The final computations of the results have not yet been made, but the preliminary figures give for the lowest point a depth of 276 ft. below sea-level. Bennett's Well, which is near this point, is 266 ft. below sea-level. These figures may be altered by two or three feet when the final computations are made, but they are probably not more than three feet in error. The Geological Survey now has elevation marks on the highest and lowest points of dry land in the United States.

It is a strange coincidence that these two extremes are both in southern California and only 75 miles apart. Mount Whitney is a foot or two over 14,500 ft. above sea-level, while Death Valley, as above stated, is 276 ft. below. Before the Salton Sink, also in southern California, was flooded by the Colorado river, it contained the lowest point of dry land in the United States, a spot 287 ft. below sea-level.

Previous estimates of the depth of Death Valley based on barometer readings gave for the lowest point figures varying from 250 to 450 ft. below sea-level. The level line of the Geological Survey is believed to be the first accurate determination of elevations in that locality that has ever been made.

LUBRICATION.—The proper lubrication of mine-car wheels and machine parts at a colliery is a most important consideration, and it is probable that few other individual factors so directly affect the cost of production per ton. It is not logical to economize in the various small items of operation and neglect so important an action as the proper lubrication of cars and machinery. One authority claims that about one-half the power expended in mill or mine is lost in overcoming the friction of lubricated surfaces. He also adds that by changing from a poor to good lubricant the loss is cut to one-fourth the power expended. It is impossible to give any fixed rules regulating the selection of a proper oil for mine lubrication; however, it is generally believed that a dark-colored oil is of greater value than one that has been filtered to a red or yellowish color, for the process of filtration is not only expensive, but removes a considerable percentage of the lubricating value. Oil of a free-running nature is best for engine bearings, as it reaches the parts more quickly than oil of a sluggish nature. Where the bearings are open and the oil is applied direct, oil of a eiscid nature is more suitable. The waste incurred in the lubrication of mine cars is hard to avoid when old-fashioned car axles are employed, and this fact makes the buyer hesitate before adopting an expensive oil. Such action is not economy after all, and although some expense is incurred when mine cars are equipped with a self-oiling arrangement, where the oil is supplied from a reservoir in the axle or better still in the web of the wheel, still the eventual saving in power and decrease in wear and waste will more than balance any expenditure.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The rule as to the sufficieney of a discovery of a placer claim was stated by a Federal Court thus: There must be some gold found within the limits of the land located as a placer gold claim, but it cannot be said in advance as a matter of law how much must be found in order to warrant the court or jury in finding that there was in fact a discovery such as the law requires. The question must be decided, not only with reference to the gold actually found within the limits of the claim located, but also in view of its situation with reference to other lands known to contain valuable deposits of placer gold, and whether its rock and soil formation are such as is usually found where these deposits exist in paying quantities; and, further, in considering the evidence bearing upon the general question, it must not be forgotten that the object of the law in requiring the discovery to precede the location is to insure good faith upon the part of the mineral locator, and to prevent frauds upon the Government by persons attempting to aequire patents to lands not mineral in its character.

Lange *v.* Robinson, 148 Feb. 799.

The statute requires that records of mining claims shall contain such a description of the claim by reference to a natural object or permanent monument as will identify it, and that a location certificate shall contain such a description as shall identify it with reasonable certainty. Under these requirements a description as beginning at a certain stated corner, declaring a parallelogram by courses and distances, and concluded thus: "Corner No. 1 of Wichita Lode joining corner No. 4 of Wichita Eagle Lode." This was held to be a sufficient reference to a permanent monument as would render the certificate *prima facie* competent as evidence of the location. It was also held that a reference to a natural object or permanent monument in such certificate was not conclusive that the law had been complied with, requiring such a reference to natural objects or permanent monuments as will identify the claim; that evidence was admissible that a person could not take the description therein, and, by referring to the natural object or permanent monument therein mentioned find the premises claimed.

Londonderry Min. Co. *v.* United States Gold Mines Co., (Colo.) 88 Pac. 445.

To constitute a discovery which will support the location of a gold-placer claim as against another mineral claimant, it is not necessary that gold should have been found thereon in paying quantities; but there must have been such a discovery of gold as gives reasonable evidence that the ground is valuable for placer mining, considering its character, location, and surroundings. The object of the law in requiring a discovery to precede the location of a mining claim is to insure good faith on the part of the locator and prevent frauds upon the Government.

Lange *v.* Robinson, 148 Fed. 799.

As assignee of an option contract for the purchase of mining claims cannot defeat a recovery of the price for the assignment on the ground of want of consideration, because the contract did not contain a sufficient description of the property, and had expired by its own limitation at the time of the assignment, where such matters appeared on the face of the contract, in the absence of fraud, and where the assignee could observe such defects at the time of the assignment.

Hunner *v.* Mulcahy, (Wash.) 88 Pac. 521.

If the attempted location of a mining claim is invalid on account of the absence of a discovery cut, another person, with knowledge of all the facts, may make a valid location within the limits of the claim attempted to be marked out by the first locator.

Walsh *v.* Henry, (Colo.) 88 Pac. 449.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A specimen of olivine Basalt was sent by J. W. A., of Los Angeles.

F. W. C., of Jackson, Ore., sends a piece of dark Hornblende-gneiss.

The mineral from W. J. R., Dale, Cal., is micaceous specular Hematite.

The deep blue rock from J. E. R., of Los Angeles, is a dumortierite Schist.

The small specimen of rock from Chico, Cal., sent by C. P. B., is Hornblende-gneiss.

The two samples from Silver City, N. M., marked F. G. C., are: No. 1, Gabbro; No. 2, Diabase.

The supposed radium ore, sent by W. H. W., of Amalie, Cal., is Grossularite, a variety of Garnet.

Specimens from Battle Mountain, Nev., marked B. F. W., are: No. 1, black silicious rock, mainly Jasper; No. 2, altered Feldspar-porphyry; No. 3, altered Granite.

The mineral specimens from Grants Pass, Ore., marked W. G. M., is Quartz, containing the blue phosphate Lazulite and the black oxide of iron and titanium, Ilmenite.

The rocks sent by G. A. D., of Nelson, Nev., are: No. 1, Andesite, or Basalt; No. 2, Andesite; No. 3, Syenite; No. 4, compact silicious rock, mainly Quartz; No. 5, Quartz, with crystals of oxidized Pyrite.

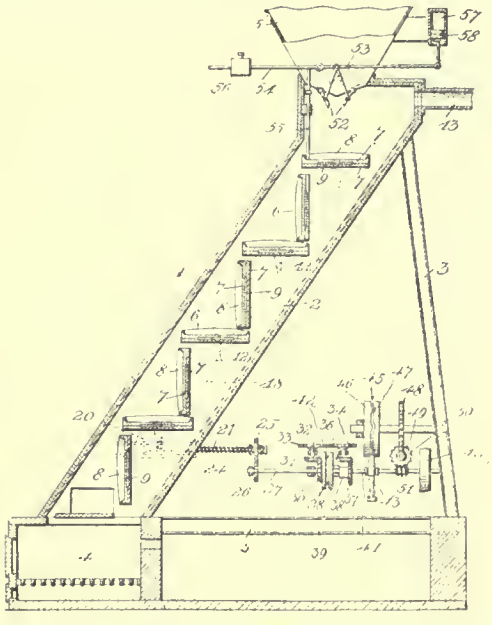
C. A. B., of Eagle, Alaska, sends: No. 1, earthy Limonite and Quartz fragments; No. 2-8, Quartz rock stained with Iron and Copper, due to the alteration of included sulphide. It ought to be assayed for gold.

COPPER EXPORTS AND IMPORTS.—A curious feature of our foreign commerce is found in the fact that, although the United States produces one-half of the world's copper and exports far more than any other country, it is also one of the largest importers of that commodity. The value of copper imported into the United States in 1906 was over $37,000,000, including in this total $6,750,000 worth of copper ore, while we were at the same time exporting over $90,000,000 worth of copper ore, of copper ingots nearly $85,000,000 worth, and of other copper manufactures between four and five million dollars. This anomaly of the greatest copper producing country of the world importing such large quantities of copper grows, apparently, out of the fact that the United States has superior smelting and refining facilities, and that the copper from its immediate neighbors at the north and south—Canada and Mexico—flows to its smelting establishments and refineries. A considerable part of the pig copper imported is brought in for the purpose of extracting the precious metals which it contains, and a part of this comes from European countries. How much of this $37,000,000 worth of copper imported is re-exported under the title of American copper cannot be determined, as any imported article which has undergone a further process of manufacturing after entering the United States is, when exported, reported to the Bureau of Statistics as a domestic manufacture.

MINING AND METALLURGICAL PATENTS.

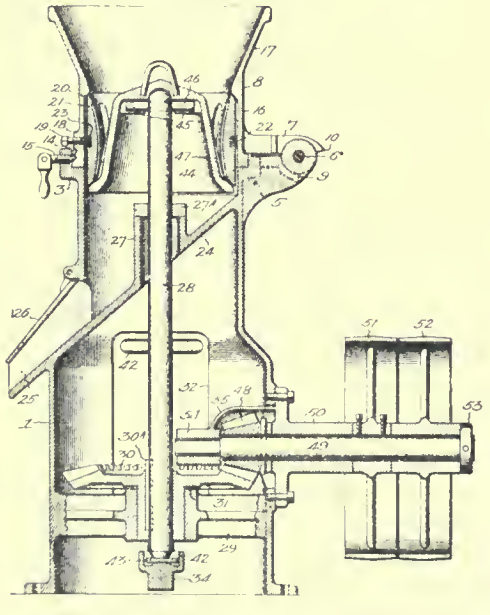
Specially Reported for the MINING AND SCIENTIFIC PRESS.

FURNACE FOR REDUCING CINNABAR ORE.—No. 845,690; Charles F. Burgess, Yreka, California.



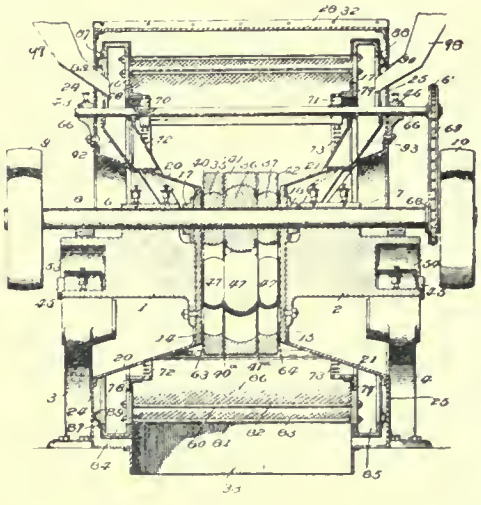
In an apparatus of the character described, the combination with a supporting-frame, of an inclined chute arranged in said frame, said chute being lined with non-heat-conducting material, an intermittently discharging hopper arranged at the upper end of said chute, a series of pivoted ore-receiving leaves arranged one above the other in said chute, means to tilt said leaves with an intermittent movement, and a heating-furnace arranged at the lower end of said chute.

ORE-CRUSHING AND GRINDING-MILL. — No. 845,067; Augustus L. Engelbach, Denver, Colorado.



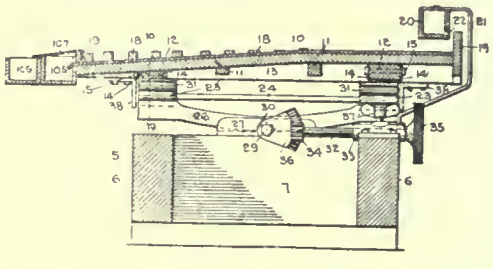
In an ore-crushing mill, the combination with the supporting-frame, of a hopper pivotally hinged to said frame, means for clamping said hopper to said frame, said hopper having a cylindrical aperture extending into its bottom a predetermined distance, said hopper being provided with an outward-flaring hopper aperture in its top intersecting said cylindrical aperture, an inwardly curved lip connecting the lower edge of said flaring hopper's bore and said cylindrical bore, a cylindrical die-ring of chilled or other suitable ore-crushing metal fitting said cylindrical bore, and provided with an upper curved edge fitting the curved lip of said die-ring, a band of soft metal encircling said die-ring, provided with a plurality of tapering V-shaped holes spaced at equal distances apart, and pointed set-screws threaded through the shell of said hopper, and positioned to bear against the upper side of said V-shaped apertures in said soft band, and hold said die-ring up against the curved lip of said hopper, with an upward clamping pressure.

GRINDING OR PULVERIZING-MILL.—No. 845,661; William S. Osborne, Marietta, Pennsylvania.



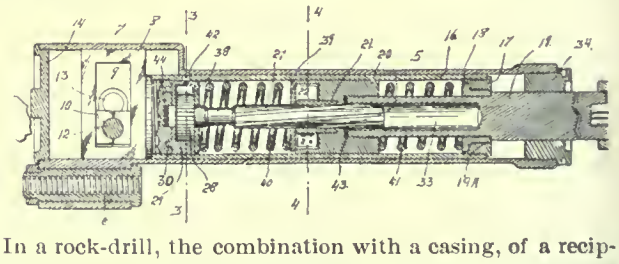
In a pulverizing-mill, a series of independent revolving rings, in combination with a series of rolls located within and imparting rotary movement to said rings, and a series of spring-mounted grinding-rolls also coacting with said rings, the rolls being of different sizes whereby a gradual reduction is attained.

ORE-CONCENTRATOR.—No. 845,449, Michael Christmann, Leadville, Colorado.



In combination a stationary frame, a concentration-deck mounted thereon, said deck having a level portion extending from end to end thereof, and a portion inclining laterally from said level portion, riffles arranged diagonally on said inclined portion, a space being left between the rear ends of the riffles and the end of the deck, a trough located along the side edge of said inclined portion, means for spraying water on the outer edge of the level portion, means for feeding the material at the upper end of said level portion, means for reciprocating said deck and means for inclining said deck transversely.

ROCK-DRILL.— No. 844,582; Henry Deitz, Denver, Colorado.



In a rock-drill, the combination with a casing, of a reciprocable yoke located therein, a hollow member connected to move with the yoke, a piston located in the hollow member, a drill-holder connected with the piston, a loose collar surrounding the drill-holder, the latter having a stop to limit the forward movement of the collar thereon, the hollow member also having a stop for the loose collar forward of the latter, a rifle-bar and ratchet carried by the hollow member and connected with the drill-holder for rotating the latter, and a yielding connection between the drill-holder piston and the hollow member.

Yerington, Nevada.

(STAFF CORRESPONDENCE.)

The mining camp of Yerington is in Mason valley, on the Walker river, 14 miles southerly from Wabuska station on the Southern Pacific railroad. At this point the valley is 4 to 5 miles wide, very fertile and much of it under irrigation. Flanking the valley on the east is the Walker range, which separates the Walker Lake basin from Mason valley; on the west is a low range of mountains, trending north-south, between Mason and Smith valleys. In the latter range, to the west of Yerington, are various copper properties, among which are the Western Nevada, owned by Samuel Newhouse and associates; the Mason Valley mine, owned by Geo. E. Gunn and associates; the Bluestone, belonging to J. R. De Lamar and associates; the Yerington Malachite, controlled by the National Exploration Co., of which Willard Snyder is manager; the Nevada-Douglas, controlled by J. D. Wood, W. V. Rice, Arthur L. Pearse, W. C. Orem and others; the Ludwig, recently sold to Frank J. Hagenbarth and others who are likewise interested in the Nevada-Douglas; the Nevada-Bonanza, controlled by Salt Lake parties and in charge of Jos. A. Harris; the Yerington Ironsides, backed by A. Hanauer, W. H. Tibbals, F. A. Flindt, C. D. Rooklidge and others of Salt Lake. The properties above are named in their order from south to north, making a chain seven or eight miles long. The Western Nevada (formerly the Dyer), Mason Valley, Bluestone, and Ludwig were operated over thirty years ago. Some of their high-grade copper ores were hauled to Virginia City, where they were used in the amalgamating plants as bluestone.

The main body of the range, comprising this district, is granite and porphyry, with bodies of limestone and lime-shale occurring at various points, and ranging from 100 ft. to one mile in extent. The mineralization occurs within the lime and along the contacts of lime, porphyry, and granite. Within the mineralized area is a garnetized lime, impregnated with copper, along a series of fissures; there is also ore in white limestone, the ore occurring in chambers. The outcrop in places is in the form of a gossan and in others a decomposed limestone impregnated with limonite. In other places the lime-shales are garnetized. The main hill comprising part of the Nevada-Douglas holdings is cut by fissures, traceable for over 3,000 ft. A series of cross-fissures occurs, broadening the mineralized area to a width of 600 or 700 ft. The great bodies of ore in this hill, as demonstrated by development, consist mostly of copper carbonates in a garnetized lime. The average of these ores is said to be 3½% copper. The first development was in the shape of adits, pits, and open-cuts. More recently an adit was started at a point near the base of the hill, on the Smith valley side, which, when driven 2,500 ft., will have 600 ft. of depth. This adit has progressed 300 ft. Electric wires are being strung from Como to the portal of this adit to supply power for the compressor and pumps. A vertical shaft is being sunk at this point to reach water-level and to get into the sulphide ore. The main camp, and possibly reduction works, will be situated on the Smith valley side. W. C. Orem is manager; J. W. Smith, superintendent, and S. S. Arentz, local manager.

The Ludwig adjoins the Nevada-Douglas on the north and has the deepest working in the district, an incline shaft having reached a depth of 600 ft., giving a vertical depth of 500 ft. Besides the development extending from this incline, there is a large amount of surface work. Practically all the ore taken out and exposed by these workings is carbonates and oxides, excepting at the bottom of the shaft where sulphides have been reached at water-level. The recent sale of this property was negotiated by Max. Junghandel, of Yerington. It is understood that in the future the management of the Ludwig and that of the Nevada-Douglas will be closely allied.——The Bluestone, managed by C. A. Week, is on the east slope of the range, facing Yerington. This property is perhaps the most thoroughly developed of any in the district. The main working level is 300 ft. below the apex of the orebody and reaches a depth of 650 ft. on the incline. The ores here are likewise in the limestone and about 100 ft. away from its contact with the granite. There is a low percentage of carbonates and oxides in this property, the bulk of the ores being sulphides, comprising chalcopyrite, with a little bornite, of medium and low grade. Plans are being considered for a reduction plant of 1,000 tons daily capacity. An experimental plant has been operated, which roasts to magnetize the pyrite and then passes them through a magnetic separator to eliminate a large part of the gangue, thus making a high-grade smelting concentrate. It is quite possible that a large plant will be erected to operate along these lines.——The Spragg mine, now owned by the Mason Valley Mines Co., lies just south of the Bluestone and comprises 156 acres. The work here is in charge of J. W. Logan. The orebodies are in the limestone, and at the contact of limestone with porphyry and rhyolite. The ore occurs in a garnetiferous limestone and consists of carbonate in the upper working and sulphides at greater depth. In the lower workings is chalcopyrite, running from 4 to 27% copper. The deepest adit cut the sulphide ore 454 ft. from the portal; at 604 ft. in a cross-cut the work is still in ore. This adit is 275 ft. deep and a depth of 400 ft. below the apex will be reached. Work will be directed to blocking out ore. Since Mr. Gunn began, 900 ft. of work has been done. This property shipped, a few years ago, 1,600 tons of carbonate ore that averaged 32% copper. The altitude of this property and the Bluestone is about 5,000 ft.——The Nevada Consolidated, in the same locality, has been opened to some extent. It is in the hands of the same parties as control the Nevada-Douglas.——The Western Nevada group occupies a portion of the southern end of the same limestone area on which the Bluestone and Mason Valley groups are situated. This is the old Dyer mine which was developed a number of years ago. Adits and pits expose carbonate ore at many points on the hill occupied by this group. A camp is being established here and a new adit is being driven for greater depth. H. C. Bowdich represents Samuel Newhouse here.——The McConnell mine adjoins this property on the north. It was developed years ago and some shipments were made. A small tonnage of ore remains on the dumps as the result of former operations. Chas. W. Lane, of California, controlled the McConnell in the early days.——The Yerington-Ironsides group is on limestone at the north end of the series. It is seven miles northwest from Yerington. This group is being developed under the direction of Fred Flindt.——The Yerington Central group, situated north of the Ludwig, is managed by J. J. Beatty, of Michigan, with H. D. Trenam in charge. A 600-ft. shaft will be sunk as rapidly as possible.——The Empire Nevada M. & S. Co., controlled by Wm. Gelder & Co., of New York, has acquired an area extending from near Walker river westerly toward the foothills, including low hills and a flat. The holdings include an old smelter near the river. A large number of open-cuts, pits, and adits on this ground show a fair grade of copper carbonate, silicate and some pyrite in a porphyritic gangue. Tests are being made to ascertain the adaptability of the ore to leaching.——The Yerington Copper Co. is developing a group of claims four miles east of town in the Walker range. A porphyry dike runs east and west through this granite range. A vein four to six feet wide strikes longitudinally through the porphyry dike and to a large extent the ore extends into the dike material. The gangue is a quartz-porphyry and the ore comprises copper carbonates, oxides, and chalcopyrite. Adits are being run on the vein at various levels and a shaft has been started at the portal of the lowest adit and the intention is to sink 1,000 ft. Gasoline power has been installed for hoisting and air-compressor work. C. D. Rooklidge, of Utah, is manager for the company.——The Blue Jay is situated on a mineralized zone that runs parallel to the Yerington. It is considerably developed and has a good showing of copper ore. Hamlin & Silvers, of Reno, have a showing parallel to the Yerington, which they are developing.

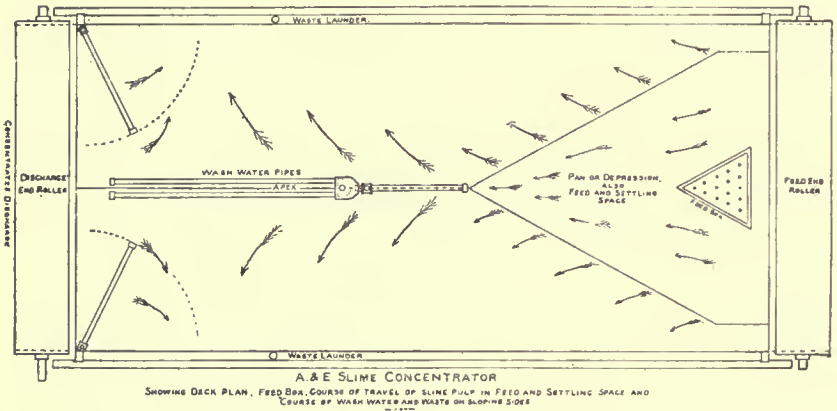
THE BUCYRUS CO., of South Milwaukee, Wis., is building 63 steam-shovels, three railway-cranes, and one railroad pile-driver for work at Panama. These comprise all of the steam-shovels, railway-cranes, and railroad pile-drivers purchased by the Isthmian Canal Commission to this date.

The A. & E. Slime Concentrator.

The great need of a concentrator that will save the maximum amount of slime in a concentrating plant, and at the same time be simple in construction and easy of operation, has always been recognized by mill operators. The accompanying illustration shows such a machine. It is claimed that in its design and construction are embodied features differing widely from anything heretofore introduced in concentrators of this class. It is the joint invention of Randall P. Akins and James P. Evans, both of whom have been for a long time connected with the Colorado Iron Works Co., and are well known as experienced mill builders.

This concentrator was developed and perfected by the inventors in an ore-testing plant; hence, it has been carefully tried as to its efficiency in operation and the saving of the minerals passing over it. For nearly a year past, since the machine assumed its present form, it has been subjected to almost continuous work on all classes of concentrating ores. Therefore, it is now offered with the assurance that the experimental element has been eliminated and that it will accomplish all that is claimed for it under regular conditions of operation.

The machine is of the traveling-belt type, with a longitudinal or endwise-shake. It is provided with a roller or drum at each end, also a wash-roller and a take-up roller below the deck. These rollers serve the purpose of carrying the belt, imparting the travel, washing, taking up, and adjusting the movement of the belt. These operating features are in a measure similar to those of a Frue vanner, but there the similarity with that and other machines ends. The great advantage of the machine lies in the form of its deck, as will be understood from an examination of the outline drawing. The triangle shown is the pan or depression and the feed and settling space, the forward lines of which are substantially level; the central line extending from the settling space to the discharge end of the machine is the apex, and is the high line or portion of the deck from which the deck slopes forward and sidewise to the waste launders on each side in a general direction shown by arrows. The belt is preferably of canvas or duck and of sufficient flexibility that in passing over the deck it conforms to the contour thereof, maintaining the form of depression into which the slime pulp is distributed from the feed-box. The water in the pan becomes quiet and the mineral constantly has an opportunity to settle, aided by the gentle reciprocal end shake, and adheres firmly to the surface of the belt. The pan or depression is so shaped that as the heavy mineral settles the lighter material is thrown by the motion of the table and gradually drawn by the belt toward the discharge point of triangular feed and settling space so that the tendency is for the lighter material to come on the deck proper at the beginning of the apex, where it is gradually washed toward the sides by a series of jets of water from a longitudinal and horizontal perforated pipe about 20 in. long, placed immediately above the deck at the beginning of the apex. Following this pipe along the apex is a similar one extending to the discharge end that supplies wash-water to the deck.



A. & E. Slime Concentrator
Showing Deck Plan, Feed Box, Course of Travel of Slime Pulp in Feed and Settling Space and Course of Wash Water and Waste on Sloping Sides
Manufactured by Colorado Iron Works Co. Denver Colo
Patents Pending.

Two independent wash-water pipes are placed near the two corners at the discharge end, which have an adjustable sweep for further cleaning the concentrates when necessary. The overflow from the feed and settling space is uniform and thin, as is also the flow over the sloping sides of the machine with the added wash-water, which gives the maximum opportunity to settle any agitated mineral that may be traveling with the gangue toward the waste-launders. The concentrates are carried over the end of the machine by the travel of the belt, which, passing under the wash-roller below the deck in water in the concentrates box, are washed off by the reciprocal motion of the table, aided if necessary by jets of water supplied through a perforated pipe playing on the belt as it comes out of the water.

The mechanical features of the machine are simple, easily assembled and cared for when in operation. The deck or top is supported by six flat oak or hickory legs, four inches wide and one-quarter inch thick at thinnest part. These legs are amply strong, and while supporting the top and preventing any side sway, are sufficiently flexible to allow of an easy reciprocal motion to the top. The main drive-shaft is placed at the head or feed end, and is fitted with cranks on each side, from which lead two side rods, which in turn are attached to the deck near supports under the head end and which impart the reciprocal motion or end shake. On the drive-shaft are tight and loose pulleys to receive the drive from the mill-shaft. The tight pulley is cast heavy and also serves as a balance wheel, giving steadiness to the motion of the table. A four-step cone pulley on this shaft is belted to a similar one on a counter-shaft on the supporting frame. A pair of bevel gears engages and transmits the power from the counter-shaft through the long side-shaft to the discharge end of the table, where, by means of cut gears that allow for the motion of the table, it is communicated to the roller at the discharge end by a worm and worm-wheel, which in its turn imparts the travel to the concentrator belt, the speed being adjusted by shifting the belt on the cone pulleys. The travel of the belt is approximately 26, 33, 43, and 56 in., respectively, per minute, as governed by these step-cone pulleys, at a speed of 225 rev. per min. of the drive-shaft. The drive-shaft can be run up to 250 rev. per min., however, without disadvantage, and on some ores to advantage.

Ample means are provided for adjusting the belt so that it will run true and also for taking up the stretch. The wearing parts are few and the belt will last a long time, and, with ordinary care, the machine cannot get out of order.

The floor space occupied is 7 by 16 ft., or about the same as any standard concentrator and less than one horse-power is required for operation.

The weight of the machine, boxed and ready for shipment, is about 3,000 lb. The price is $450. It is manufactured by the Colorado Iron Works Co. of Denver.

Trade Treatises.

The Denver Fire Clay Co. has issued its Bulletin No. 24, calling attention to the crucibles, scorifiers, and muffles made by the firm, and to the Case gasoline furnace.

Buff & Buff, the wellknown instrument makers, of Boston, issue a catalogue of their latest engineering, surveying, and mining instruments. It is handsomely illustrated.

The Rapid-Economy Stamp-Mill Co. has sent us a copy of their new and attractive folder, describing the Rapid-Economy mill. The publication is well illustrated, including photographs of all parts of the mill. The company states that this mill has greater capacity, consumes less power, costs less for repairs per tonnage crushed, and saves a higher percentage than any other stamp-mill.

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Editorial.

AMERICAN mining engineers visiting London can obtain copies of this journal from Leathwait & Simmons at 5 Birchin Lane.

UNDER 'Market Reports' we publish each week the daily average prices of copper, lead, spelter, and silver at New York. Those who buy or sell ore will find them trustworthy. To our subscribers in San Francisco we can give the quotations by telephone.

WE WELCOME the first issue of *The Canadian Mining Journal*, a new fortnightly paper that is the successor of *The Canadian Mining Review*, a monthly journal, which for twenty-three years has occupied an authoritative position. We wish our contemporary every success.

THE PRESENT prosperity is viewed with timidity by many men who are well informed. The fact is, the whole world is out-running its credit. Much of it has been devoted to real development, but undoubtedly much of it also has been squandered on paper enterprises, whose failure is imminent. The banks of New York have been skating on thin ice in the effort to support the stock market. A serious collapse is probable as soon as the exhaustion of capital becomes evident.

THE other day at Goldfield there was a meeting of "millionaires and others," so says an Associated Press dispatch. It was held at midnight, hence the disreputable character of the crowd. The "others" were really respectable people, despite their temporary association, for which they would doubtless be ready to apologize. The fact is, the Nevada camps are making millionaires so rapidly, according to the *Daily Scream*, that the plutocrats of the mines are becoming common, not to say vulgar. Wealth has almost ceased to be a distinction at Goldfield; soon the millionaires will be undistinguishable from the "and others." Not to be a millionaire will be regarded as a pose.

SECONDARY ENRICHMENT in copper lodes has been so thoroughly demonstrated to be a factor in their economic value that any mining engineer who appraises copper mines without considering this matter, is doing an injustice to his client. We learn that the bottom workings of an important mine in Placer county, California, exhibit the lower limit of a zone of secondary enrichment, the high-grade secondary copper pyrite in iron pyrite being succeeded by an original ore, poor in copper and highly silicious. Because secondary enrichment, with deposition of chalcocite, extends to over 2,000 feet in certain mines at Butte, it must not be expected that Nature will be as generous elsewhere. At Butte three or four successive periods of

fracturing and thermal activity, at intervals, have produced conditions extraordinarily favorable to the resolution and re-precipitation of copper in lodes of remarkable width and number.

Standardization.

THE Institution of Mining and Metallurgy, an organization of professional men that has won an authoritative position, has recommended the adoption of certain definitions, namely:

1. That the 'ton' be a weight of 2,000 lb. avoirdupois.
2. That the 'miner's inch' be a flow of 1.5 cubic feet per minute.
3. That the 'gallon' be the gallon of 10 pounds.
4. That all temperatures be expressed in degrees Centigrade.
5. That gold and silver returns be stated in terms of fine metal, and not as 'bullion.'
6. That the gold contents of ore be expressed in the Troy ounce of fine gold, worth $20.67 or 85 shillings.

All of these recommendations will, we believe, receive the endorsement of the profession. It will be a great boon to technology if the complexity and confusion due to discordant units of measurement and weight are eliminated by an agreement to use one of each kind. The choice made exhibits much good sense, and it is due to the fact that the committee is composed of English and American engineers of wide experience in such matters. Think of the joy of getting rid of the 'hundredweights,' 'quarters,' and 'stones' of an obsolete English system; consider the advantage of retiring the multitudinous kinds of 'miner's inch' that do duty in different American States; and imagine the satisfaction of knowing the quality of the metal produced in a mill, instead of talking in terms of an uncertain 'bullion,' that may be half impurity for all that the term conveys. And on the top of its excellent recommendations, the committee on standardization asks for further suggestions as to weights and measures. We venture to make one, having learned by experience the necessity for it. Everyone knows the lax manner in which Mexican currency is treated; a report says that a mine in Mexico produces ore worth 20 dollars per ton or that the cost is $10 per ton. It is often left to the reader to guess whether the reference is to American or Mexican dollars. Of course, the sign 'U. S.' or 'Mex.' may be added, but this is clumsy and is apt to be omitted. The present writer has found repeatedly that in notes gathered in Mexico he has set down that something cost $3.50 or $7.80, and in reading such notes long afterward he has wondered which it was, Mexican or American currency, for both are used interchangeably, and the reports of some companies are given partly in one and partly in the other. There is no need for the confusion. We have the *peso* and the *centavo*. Let dollars be the American unit, *peso* be the Mexican; and then if anyone desires to convert either into terms of the other, he can do so by referring to the exchange as recorded at the time in question. When the reference is to the money value of any thing in Mexico, let us use *peso* and *centavo*. This is a suggestion that we made a year ago; the experience of another twelve months has strengthened our belief that it ought to be adopted.

Labor Unrest.

AT Bisbee, at Butte, and at Goldfield there are strikes or lock-outs, and in other mining centres there are signs of trouble. In Arizona the Western Federation of Miners is trying to control the labor unions of the Warren district and the question is simply whether Bisbee is to be an 'open' or 'closed' mining camp. A year ago the miners in mass meeting voted in the proportion of five to one against affiliation with the Western Federation. Since then there has been a uniform raise in wages, the management of the Copper Queen and other companies recognizing frankly that the cost of living has risen throughout the country and that as the price of the metal extracted from the ore has risen to a corresponding degree, it is only fair that the men's wages should also be increased. Although a large proportion of the workingmen at Bisbee do not belong to any union, there has been no discrimination on the part of the management against those that were known to be union men. There have been no labor outbreaks, because Mr. James Douglas and his staff are humane and sensible, a combination not always characteristic of the employers of labor. There should be no room for the unintelligent methods of the Western Federation at Bisbee. At Butte a strike in the newspaper offices threatened to embroil the whole community, for Butte has always been a smouldering volcano of labor tyranny. Although wages were voluntarily raised by the mining companies only last November, from $3.50 to $3.75 per day, the miners recently voted for another advance in order to meet the increased cost of living due to the demands of the smaller labor unions—in other words, the bakers, the butchers, and the tailors have made life at Butte too expensive even for the highest paid mining laborer in the world. After all, it is the difference between income and outgo that represents the saving of the workingman and in this respect the high-priced camps are greatly over-rated. The labor unions, when they are too exacting, occasionally make life hard for their own people. The rate of wages does not measure a man's comfort. At Goldfield, there has been agitation due to the attempt of one labor organization to impose itself on the others, and the community is in danger of a vendetta between two factions. Here the situation is embittered by the presence of some of the people that took part in the Cripple Creek troubles and the legacy of hate from a bygone terrorism threatens to interrupt the working of mines recently made famous by their productiveness. There is this to be said, that any widespread strike now would be folly, for it would precipitate a depression that is surely coming, that will be accompanied by the withdrawal of capital from new enterprises, and the general retraction of industrial activities. The laboring man will do well to make the most of the present era of high wages and the captain of industry will be wise if he makes effective use of the capital now at his disposal. A quarrel between them at this time will be greatly to the disadvantage of both.

By the Way.

Concerning the great break in the Colorado river, fully described in our issue of October 20, the *Engineering News* says:

The necessity for holding the Colorado in its old channel with absolute certainty has now been shown by a great object-lesson. It is apparent that this necessity will increase from now on with the rapid influx of settlers to the Imperial Valley. Every farm and home there is dependent on the strength of the banks by which the river is held in check, just as surely as every house and hamlet in the Holland polders is dependent upon the strength of the dikes. Now that the river is restored to its old channel, there should be no engineering difficulty in holding it there with certainty, and in giving perfect safety to those in the valley below.

We have said there is no engineering difficulty. There are other difficulties, however, of a most serious sort. The work of closing the break has been done by the Southern Pacific Co. That railway corporation responded most nobly to the appeal of President Roosevelt. It was absolutely the only organization that was able to do the work in time, and time, as shown above, was the all-important element. Unless the closure was effected at once, it could not be effected at all. No other organization, great or small, not even the United States Government itself, had the Executive been given unlimited powers by Congress, could possibly have brought together the men and tools and materials in time to save the day.

But now that the emergency has been met and there is time to look to the future, the railway company which has so honorably met the call of public duty ought to be relieved of further responsibilities. When the question is asked where the responsibility should now be placed for the permanent control of the Colorado river, it is difficult to find any other reasonable course than for the United States to take charge. That no private irrigation company, organized for business and profit, could well be trusted with such great responsibility, should be clear anyway, and has certainly been demonstrated with absolute conclusiveness by the events of the past three years in this region.

It may be suggested that the States could assume control; but part of the land to be protected lies in California, part in Arizona, and a considerable part, including the whole lower course of the Colorado where breaks must be guarded against, is in the Republic of Mexico. Thus the protection of a large area of United States territory from inundation depends on the control of a river channel in Mexico.

We can see no satisfactory solution of this difficult problem except the purchase from Mexico of this territory and its annexation to the United States. At present this country is in the anomalous position of having a great valley of enormous potential value which is likely at any time to be flooded and destroyed for all time by a river on foreign territory overflowing its banks. Mexico, on the other hand, has either to control the river herself, to protect her neighbor, or admit foreign forces to her soil to do the work.

The whole situation is so likely to lead to international complications that there should be no difficulty in arranging a satisfactory treaty of annexation. Conceivably, Mexico may desire to retain a narrow strip at the very mouth of the Colorado to give her access by land to her territory in Lower California; but this might possibly be met by purchasing the whole lower peninsula. While this has little value, save possibly for mineral deposits, yet unknown, its possession would place under United States jurisdiction a region commonly reputed to be a resort for fugitives from justice.

A word should be said regarding the unprecedented methods adopted to close the *crevasse*. The problem was one never before presented, so far as we are aware, in all the annals of engineering. Here is a great river, subject to extreme and sudden variations of flow, from 2,000 to 100,000 cu. ft. per second. Its whole volume is flowing through a *crevasse* in its banks some 2,000 ft. in width, and the whole region is one mass of silt and mud, no solid foundation anywhere. Worst of all, the time to effect closure is extremely limited. There is no time to make elaborate plans, and little time even to consult as what is to be done.

Under such circumstances it would be ungracious to criticize what was done or not done. It appears to be clear that the early attempts at closure were a failure largely because the magnitude of the task in hand was not appreciated, and also because the funds and forces available were inadequate for the work. Of the later efforts, when the whole strength of the Southern Pacific organization was concentrated on this work, the plan of work in which the wooden gate was constructed appeals to an engineer as sound and well schemed. The plan would undoubtedly have been carried to success had not the drift carried down by the flood lodged against the gate and obstructed the passage of water through it.

The method by which successful closure of the breach was finally effected consisted, as already recorded, of carrying pile trestles across the *crevasse* and dumping rock as rapidly as possible from these trestles, thus making a rock-fill dam across the channel. Had any considerable height been attempted with these dams, the scour would doubtless have concentrated at some point and undermined the trestle; but by making successive lines of parallel trestles and dams, the fall at each was kept within moderate limits and the structure remained in place.

This simple plan of operation, while it presented many possibilities of failure, offered the great advantage of doing the work with railroad machinery and railroad methods, and therefore of rapidly effecting results. We can conceive of no other method by which an effective barrier could have been constructed across the *crevasse* in the limited time available. It will be apparent also, that, had it not been for the branch line built last summer to the site of the break from the main line of the Southern Pacific Co., it would have been impossible to have assembled the men, material, and supplies necessary to effect the closure of the break by this or any other method of operation.

In discussing this subject a month ago, when the possibility of closing the breach was still a matter of grave doubt, we said that Congress ought to act immediately on the President's appeal for funds. Now that the Southern Pacific Co. has gone forward and completed successfully the task, relying on the honor of the Nation to reimburse it for its expenditure, we say with renewed emphasis that Congress ought to act promptly and justly in this matter. Doubtless, corporations have no souls, and this particular one has been frequently accused of lacking all moral principle in addition. In the present case, however, it has shown something of the same honorable quality that impels a man to risk his own life or property to check a conflagration when no one else is at hand to act. The Southern Pacific Co. is entitled to fair and liberal recompense at the hands of the Nation for the great service it has performed, and it would be a proper thing also to recognize in some appropriate way the efficient services of the leaders in the field who have finally won a great victory after the discouragement of repeated defeats.

Personal.

W. MURDOCH WILEY is at Guanajuato, Mexico.

ARTHUR R. TOWNSEND is at Telluride, Colorado.

THEO. F. VAN WAGENEN is at Zacatecas, Mexico.

W. LAWRENCE AUSTIN was in San Francisco recently.

C. M. FUELLER has returned to Denver from Mexico City.

CLAUDE V. HAINES has left London to proceed to Spain.

STEWART TOD is visiting New York from Batopilas, Mexico.

R. DE H. ST. STEPHENS has returned from Russia to London.

W. B. KEHOE, formerly of Ouray, Colo., is now at Barstow, California.

A. B. CARPENTER, of Carpenter & Brennon, Mexico City, is at Los Angeles.

E. D. MCDERMOTT is at La Estrella copper mine, near Guadix, in Spain.

JOHN A. REID, of Stockton, is examining mines near Keeler, California.

J. S. CARNAHAN is manager of the San Pablo mine, at Monterey, Mexico.

ROBERT S. LEWIS is engineer with the Warrior Copper Co. at Globe, Arizona.

J. B. FLEMING is now with the Joshua Hendy Iron Works, San Francisco.

M. S. WALKER is with the Southern Cross Gold Mining Co., at Cable, Montana.

J. B. PITCHFORD has been visiting the copper mines of Shasta county, California.

F. LYNWOOD GARRISON is in Santo Domingo. He will proceed from there to Mexico.

G. D. LOUDERBACK is now associate professor of geology in the University of California.

E. W. SEBBEN, of Denver, left this week for Utah, where he has some examinations to make.

GEORGE I. BENTLEY is manager for La Ventura Mining Co., at Oeotlan, in Oaxaca, Mexico.

J. V. N. DORR, of Lead City, South Dakota, has opened an office in the Bank Bdg., at Denver.

COURTENAY DE KALB left Los Angeles on March 21, on a visit to New York and Philadelphia.

J. MALCOLM MACLAREN is expected in San Francisco on his way from New Zealand to London.

D. H. BRADLEY, JR., is directing the operations of the Parral Con. Mines Co., in Chihuahua.

ERLE HUNTLEY has been appointed manager for the Zinc Corporation at Broken Hill, Australia.

JAMES ASKELL is general manager for the Santa Rita Mining Co., at Sombrerete, in Zacatecas, Mexico.

F. G. OLENDORF is general manager for the Azteeas Mineral Co., in the Aleeron district of Guerrero, Mexico.

W. J. FARRAGUT has been appointed assistant to the manager of the Dolores mine, in Chihuahua, Mexico.

FRANK E. SHEPARD, president of the Denver Engineering Works Co., has returned to Denver from the East.

J. RODNEY BROWN has been appointed superintendent of the cyanide plant of the Peregrina mill at Guanajuato, Mexico.

CHARLES W. HOWBERT, formerly of Cripple Creek, is now manager of the Cienguita Copper Co., in Sonora, Mexico.

HAROLD I. BROSIUS has accepted the position of assayer and chemist with the Imperial Gold M. & M. Co. at Apex, Colorado.

J. M. CAMERON has left Goldfield, and has accepted the position of manager for the Butte Central & Boston Copper Co. at Butte.

DAVID H. LAWRANCE, of Denver, has just returned from a month's trip to Nevada, where he visited some of the principal camps.

H. H. HEDGES has returned to Los Angeles from Bluefields, Nicaragua, where he designed a mill for the treatment of gold ores.

E. J. BUMSTED, formerly with the Esperanza at El Oro, is now chief engineer to the Velardeña Mining & Smelting Co., in Durango, Mexico.

J. ALFRED MAYLAND, chief engineer of the Peñoles Mining Co., Mapimi, Durango, has resigned, and will open an office at Los Angeles.

G. C. HEWETT, of Colorado Springs, has been appointed consulting engineer for the old London mine, in Park county, Colorado. He is now on a short visit to Wyncote, Pennsylvania.

L. VOGELSTEIN & Co., New York, give the following figures of consumption of foreign copper in Germany for the month of January, 1907:

	Tons
Imports of copper	8,950
Exports " "	618
Consumption "	8,332

Of this quantity 7,129 tons were imported from the United States.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, March 21.

Argonaut	$4.80	Brunswick	$0.45
Con. Virginia	0.96	Savage	0.74
Mexican	0.69	Sierra Nevada	0.69
Ophir	2.27	Yellow Jacket	0.95
Belmont	4.40	Midway	1.76
Combination Fraction	4.00	Montana	3.57
Goldfield Con	7.69	Mohawk	15.50
Jim Butler	0.97	Nevada Hills	3.55
Jumbo	4.20	Red Top	3.25
Jumping Jack	0.21	Sandstorm	0.50
Manhattan Con	0.65	Silver Pick	1.27
Manhattan Dexter	0.20	Tonopah Ex	3 75

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
March 14	25⅜	6	6⅞	67⅞
" 15	25⅜	6	6⅞	67¾
" 16	25⅜	6	6⅞	67½
" 17	Sunday.	No market.		
" 18	25⅜	6	6⅞	66⅞
" 19	25⅛	6	6⅞	66¾
" 20	25⅛	6	6½	66½
" 21	25⅛	6	6½	66⅜

ANGLO-AMERICAN SHARES.

Cabled from London.

	March 14. £ s. d.	March 21. £ s. d.
Camp Bird	1 6 0	1 4 9
El Oro	1 9 6	1 7 6
Esperanza	2 4 6	2 2 0
Dolores	1 16 3	1 15 0
Oroville Dredging	0 19 0	0 17 6
Stratton's Independence	0 3 0	0 3 0
Tomboy	1 17 6	1 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices March 14.	March 21.
Bingham Central	1¾	1½
Boston Copper	23	27½
Calumet & Arizona	169	164
Cumberland Ely	9	10
Dolores	8⅞	8
El Rayo	5½	5
Guanajuato Con	4½	4¼
Giroux Con	8	8¾
Greene Con	21	24¼
Nevada Con	13	14¾
Nipissing	11¼	12¼
Tennessee Copper	39½	31¾
Tonopah Ex	3⅛	3⅞
Tonopah-Belmont	4¾	4⅜
Tonopah	16	16
United Copper	66	65⅛
Utah Copper	29	30¼

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

Mining Summary.

ALASKA.

NOME DISTRICT.

Recent reports from Nome state that the operators refused the demands of the union, and have formed a permanent organization. The miners demanded an increase in wages, to $4 per day and board, and directed that all non-union men should be discharged. The operators have decided to offer $3 per day of 10 hours and board, during the closed season, when only hoisting is done, and $5 per day during the open season, when the dirt is being sluiced. The result has been that many of the claims are being worked by non-union miners and the operators seem to have carried their point. The $3 scale will be in force until May 15, when the pay will be increased to $5 per day and board and lodging, which scale will remain in force until October 15. The second bench is not showing up as well as was expected. Many prospectors have sunk to bedrock without finding a color, and but few have discovered pay-dirt in quantity.

KETCHIKAN DISTRICT.

The Mamie mine shipped 30,000 tons of ore to the smelters in 1906. There are 1,200 ft. of workings, and 1,200 ft. of diamond-drill holes. This mine is situated on Kasaan peninsula, 5,500 ft. from the Hadley smelter, with which it is connected by aerial tram. N. O. Lawson is the manager and John Hampson the superintendent.——The Alaska

Map of Arizona.

Smelting & Refining Co.'s plant at Hadley has a capacity of 400 tons per day. The plant produces matte, but converters may be added to blow the matte to blister-copper. Paul Johnson is the manager.——The Mt. Andrew group has produced 9,000 tons of ore, which was sent to the Crofton smelter in British Columbia. W. C. Freeburn is the manager.——The Hadley Con. Copper Co. is operating the Stevenstown, Blue Jay, and other mines on the east coast of Prince of Wales island. The output is about 100 tons per day, the ore being rich in copper. George E. Green is the superintendent.——The Alaska Copper Co. is operating its mines and smelter at Coppermount, and also the Rush and Brown mines at Kasaan bay. The smelter is treating about 275 tons per day.

ARIZONA.

GILA COUNTY.

No more work has been done to prove the extent of the new sulphide orebody in the Old Dominion.——The Gem shaft of the Globe Consolidated Co. is down 535 ft., and is still in diorite. A station is being cut at the 500-ft. point. Sinking has been resumed in the Mallory shaft of this company, and driving on the vein on the 460-ft. level continues. ——The Mitchell smelter will be blown in at once. Ore and coke are arriving daily. The company will produce matte until the converter arrives.——It is reported that the Inspiration mine at Globe has been sold to the Lewisohn interests for $3,000,000.——The shaft of the Arizona National has cut 42 ft. of ore, assaying 12% copper.

CALIFORNIA.

NEVADA COUNTY.

The Bear River Tunnel Co. is driving on a good vein, carrying gold and sulphides. The company owns six claims. ——The Maryland mine will be re-opened. The manager, Bray Williams, has returned from an Eastern trip and reports that the property is well financed. The shaft will be sunk 1,000 ft. deeper.——The vertical shaft at the Boss mine, near Sweetland, is down 150 ft., and will be continued to 600 ft. The company expects to open good copper ore. Electric power is obtained from Colgate.——Some good ore has been struck in the Lincoln mine, near Canada hill, at the bottom of the 60-ft. shaft. The property is bonded to the Resartus company.——The annual report of the Brunswick G. M. Co. shows that the company is in good shape. The present work is done at a distance of about 3,000 ft. from the shaft, which adds to the working cost, and it may be decided to sink a new shaft. R. Gilman Brown has resigned the presidency and gone to London to live. Last year $100,000 in bullion and sulphides was won, and a $14,000 dividend was paid.

(Special Correspondence).—Otto Woehler is doing development work on the property recently bonded by the California Gold & Copper Co. There is a tunnel 900 ft. long which is proving the property.——El Oro Mining Co. is arranging to begin work on its gravel claims. The first work will be to re-open a 2,300-ft. tunnel, in the face of which an incline will be sunk to reach the bottom of the channel, which has proved very rich.——The Fairview mine, 21 miles north of Nevada City, will soon be ranked as a producer. The tunnel is in 325 ft., and has cut through a 30-ft. vein which runs from $4 to $6 in gold, carrying silver and some copper. During the coming summer, the company will install a plant to crush 100 tons per 24 hours.—— Mr. Bishop, of Tonopah, and associates, will commence work at the Eclipse mine, a few miles below Nevada City. ——The 15-stamp mill at the Mtn. Maid mine, near Nevada City, will be in full operation by March 15. There is a quantity of ore blocked out and the owners feel elated over the present showing.——The Bullion mine, south of Nevada City, is unwatered and development work will be resumed with a large force of men.——The Fruitvale mine, in the Washington mining district, is producing well. The new strike resembles ore from the famous Tightner mine, only eight miles distant. In one day $20,000 was taken out.——The Coan Mining Co. at Indian Flat is erecting a four-stamp mill. The shaft is down 75 ft., and there is sufficient ore blocked out to keep the mill running continuously.——The Dolly Madison G. M. Co., about five miles from Nevada City, intends to erect a 40-stamp mill this year. As development progresses the mill will be enlarged. There are 100,000 tons of ore in sight, which can be placed in ore-bins for from $1 to $2.50 per ton. A recent mill-run on ore from 300 ft. of the lode gave returns of $10 per ton. This property will undoubtedly be a good producer for years to come.

Nevada City, March 15.

PLACER COUNTY.

There is great activity on the Forest Hill divide, both in quartz and gravel mining.——The Pioneer mine, below Damascus, will be opened by a tunnel run at a lower level than any of the previous workings. The Southern Cross, on the north fork of the American river, has yielded some good ore, and it is to be consolidated with the Pioneer and a tunnel will be run nearly 6,000 ft. long, to cut all the veins on both properties.——The Rawhide mine, which lies farther up the river, has been producing some rich ore.——In addition to these properties, the mines at Snow Mtn., Bald

Mtn., Black Canyon, Sailor Canyon, and the Barton mine will be worked this season.

SHASTA COUNTY.

The Mountain Copper Co. is again in need of fluxes for its smelter at Keswick. Every mine manager in the district has received a circular letter from the company inviting shipments of silicious ores at once, although the first furnace will probably not be blown in for another month. It will not be as easy to get ores of this kind as it was two years ago, before the smelter shut down, as in the meantime the Mammoth Copper Co. at Kennett is consuming all the gold ore produced from Old Diggings and Quartz Hill, and even from Siskiyou county and southern Oregon. The White Oak and Crown Deep will probably be large shippers of silicious ores to the Mountain Copper Co.—— The Washington gold mine at French Gulch was recently sold for $150,000. There are three veins on the property.

SIERRA COUNTY.

A rich pocket was opened in the Fruitvale mine, situated on the Yuba River side of Chipps ridge. Andrew Fitzgerald, the superintendent, reports that $20,000 was taken from one pocket that was opened in the tunnel.——In the Downieville region several new properties are being worked. The tunnel at the White Bear is being pushed; and the Telegraph Drift M. Co. is working a force of men, developing the quartz vein. This mine is equipped with an electric-power plant, having generators on Goodyear creek.——The new tunnel at the Sebastopol mine is in 200 ft.——At the Papoose mine in Jim Crow cañon, the new mill is nearly finished, and will be in operation by April 1.——Work has again commenced at the Sovereign mine in Ladies cañon. Air-compressors, rails, machine-drills, and other supplies purchased last fall from the Marguerite company, will soon be delivered, and a new tunnel will be started that will tap the veins at a depth of about 1,000 ft. A 10-stamp mill will be built, and a flume one mile long will bring the necessary water.——At the Antlers mine on the Middle Fork, a lower tunnel will be driven for 1,000 ft. This property is being financed by H. W. Turner, of Portland.——The West Point company at Monte Cristo is working a force of men on the gravel deposit.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondenee).—With the advent of early spring general activity in the Georgetown district is noticeable, and during the next few weeks a number of old-time properties will be undergoing development. The Democrat Mt. Mining Co. is carrying on development work. The new 50-ton mill is running and concentrates are being turned out. The initial shipment was made this week and returns of $70 per ton were received for silver and lead. Early the coming week the aerial tramway running from the Moline tunnel will be started, and as there are over 2,000 tons of $16 ore awaiting transportation, the mill-bins will be kept full. Were it not for the zinc contained in the product, the ore would be shipped direct to the Denver smelters. Jerome Smith the manager, states that the work of driving the Kelly tunnel forward will shortly be started.——The Commonwealth and Delaware mines, situated in Peruvian district have been bonded and leased to J. A. Noone, who in turn transfered his privileges to the Togo M. & M. Co. The bond ealls for $26,000 and runs for three years. The Togo Co. will at once repair the old workings. These mines produced heavily of silver-lead ore during the years 1879-80, the average returns received in settlement being $45 per ton.—— Ten sets of lessees are at work on the Lamartine and all are in pay-ore. This property has produced $3,000,000 and the output will be kept up to the standard of former years.—— The Silver Leaf adit being driven into Republican Mtn., has intersected lode No. 3, and a big body of mixed iron and quartz has been encountered. No driving has yet been started as the manager, B. J. Martelon, is desirous of tapping lode No. 4, which lies about 100 ft. distant. It is believed that a rich pocket will be found as soon as the vein is reached, as from shaft-work a heavy production resulted a number of years ago.——Machinery has been installed at the Shively workings. The adit driven to cut under the old shaft is being advanced at the rate of five feet per day, and the work will be completed early in July. At that time the workings will be drained of water, at which time the mine will be placed in the shipping list.——Heavy shipments of concentrating ore are being made from the Pulaski, situated on Leavenworth Mtn. An average of 12 tons is being broken daily. The product is sent to the Newton mill at Idaho Springs, and by concentrating from four to five tons into one, settlement is made at the rate of $62 per ton.—— Tho Creole property, situated on Leavenworth Mtn., has been bonded and leased to D. F. Sprouse & Co., the bond calling for $25,000 and running for two years. The lower adit is being placed in working condition, and within the next few days the work of pushing the bore forward will start. Within 100 ft., the junction of the Creole and Argentine veins will be reached, and in view of the fact that a big streak of high-grade ore is showing in the winze sunk from the adit above, it is expected that a rich pocket will be uncovered.——Shipments are being made from the block of ground operated by H. Davenport on the Wide West. The ore is high-grade, carrying 420 oz. silver per ton and 20% lead.——Jos. Garbolino has a rich lease on the same mine, and is working to the east of Mr. Davenport.——The Uncle Jack M. Co., operating on Breckenridge Mtn. near Empire, has secured possession of 400 acres of mineral-bearing ground. In the holdings are included the Overland, Boston, Mammoth, and Abeel groups of claims. A. R. Perry, of Empire, the manager, announces that future work will include the driving of the adit started on the Mammoth, to intersect the Jupiter, Overland, and Boston lodes.——The Joplin tunnel on Republican Mtn. has been advanced for 475 ft. and within the next 70 ft. the heading will penetrate Gambetta ground. This property is considered one of the most promising lead and zinc propositions of Georgetown, as from sinking a shaft to a depth of 70 ft. a production of $25,000 resulted a few years ago. An additional depth of 380 ft. will be attained through the present workings.—— The Vidler tunnel was advanced during the month of February a distance of 204 ft. This work was performed on the eastern side of the pass and the average daily footage driven was better than 10 ft., as work was only carried on for 20 days. It is believed that the lode cut during the past week was the Arapahoe, which was recently purchased for $40,000.——Heavy shipments are being made from the Mineral Chief mine, on Republican Mtn. The ore is lead-bearing, returning from 70 to 75% of that metal, with silver varying from 70 to 80 oz. per ton. The seventh level is being driven forward and as soon as the objective is reached, a raise will be put through to No. 6, and at that time the mine will be the best developed property in Clear Creek county.——The Scott property, situated on Republican Mtn., is showing up strong. A body of smelting ore is being followed which measures 18 in. across, the average value being about $40 per ton in silver and lead. Shipments will be started soon. John White of Georgetown is the manager.——A new strike has just been made in the Douglas mine on Douglas Mtn. In running the drift east an eight-inch streak of silver and lead ore has been exposed which assays 40% lead and 45 oz. silver per ton. In the upper workings, a two-foot body of ore is showing which carries 34% zinc, 40% lead, and 35 oz. silver per ton. Shipments are being made to the Newton mill at Idaho Springs where the product is concentrated.——Peter Nelson, leasing on the Colorado Central, has a fine streak of silver-lead ore which runs $225 per ton.

Georgetown, March 11.

SUMMIT COUNTY.

(Special Correspondence).—The Abundance M. & M. Co. has just held its annual stockholders' meeting at Kansas City, at which S. B. Prevost was re-elected president. Work will be started soon.——The New York group on Gibson hill is being worked and ore containing lead, zinc, and iron pyrite has been shipped to the sampler, and to testing works, where the best method of treatment will be ascertained.——The Sallie Barber silver-lead and zinc property, situated on Bald Mtn., has been sold to J. C. Putner. A hoisting and pumping plant is to be installed at the main shaft. It is reported that at the bottom of this shaft there

is a vein of zinc ore three feet wide. This property has always been considered one of the best little mines of the camp.——The lessees working the lower levels of the Dunkin, an old-time producer, are making a fine showing. A second shipment has been made of 23 tons of ore valued at $40 per ton. The property is situated on Nigger hill.—— The Beaver Creek Mining Co., which has done some work in the Breckenridge district, has been re-organized under the title of the Swastika Mining Co., with a capital of $2,000,000. S. H. Dunlap, manager, states that work on the Minnie and Lucky mines will be started at once.——J. A. McDonald, the dredge-master of the Reliance Dredging Co., has been having the plant overhauled and is awaiting the decision of the Colorado Con. Mining & Electric Power Co. in connection with their intended sale of the Gold Pan plant to the placer company now owning the Swan and Blue River placer lands. The dredges on the Swan and Blue rivers are to be operated by electric power and the Reliance company is trying to make arrangements for similar power. Ben S. Revett is at the head of both of these enterprises, so it is probable that the old Gold Pan plant and interests will be absorbed by these two organizations.——Robert W. Foote of Breckenridge has obtained a right of way from the Rose of Breckenridge Co. to run a tunnel through the property to exploit his Ella claim that lies above it on Mineral hill, to the west.——M. Oehler of Jefferson reports that a streak of gold-lead ore has been opened in the main drift on the Mt. Guyot property. This ore assays $50 per ton. Mr. Oehler closed a contract with local men for extending the work 400 ft.——The Swandyke Gold M. & M. Co. has been carrying on experimental tests on ore obtained from the Three Kings mine, and it is stated that the results were good.

It is the intention of the company to further exploit the orebodies, with the idea of installing a treatment-plant. This will be a great help to the district, which has large orebodies but no plant to treat the ore.——E. W. Sebben recently reported on the property of the Square Deal M. & D. Co. He declares that the outlook for the company is excellent, and advises the continuance of the main tunnel.—— The Hibbs M. & M. Co., operating on Royal Mtn., is working three shifts of men and is taking out high-grade gold ore for shipment to the smelters.

Breckenridge, March 16.

TELLER COUNTY.

(Special Correspondence).—The Ajax mine on Battle Mtn., has produced about 1,000 tons of ore during the month of February, the average value for that period being in the neighborhood of $35. The ore is obtained on the seventh, eighth, and ninth levels, and is mined by both lessees and the company, the lessees producing in the neighborhood of 300 tons per month. Fifteen machine-drills are being operated, some of them on development work. At the meeting of the stockholders held at Denver last month, the proposition of the company building its own mill was brought up.

It was favorably considered and the construction of the plant should take place in the near future.—— The Little Clara lease on the Work property, operated until the 15th of this month by Marsh & Hodges, has been granted to A. E. Humphries of Denver and H. D. Thompson of Cripple Creek. This was decided at a meeting of the Work directorate held on the 7th inst.

The royalty on the new lease ranges from 15 to 65%, the lower figure being for ore under $30. It is said that lessees have agreed to give the Work Co. one-quarter of their net profits in addition to the above royalties. The property will have to keep up to its former record in tonnage and value to be able to stand these charges, but it is stated that the company is willing to make any reasonable concessions if the terms are found exorbitant. The lease is for 2½ years. —— Some of the slightly damaged machinery of the Economic mill, situated in Eclipse gulch, which was burned some weeks ago, has been sold to the Portland Gold Mining Co. It will be used in the new cyanide plant being constructed at Colorado City for the treatment of the tailing from the Portland mill.

Cripple Creek, March 18.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).— Indications are that the Elk City district is coming to the fore again this spring, there being renewed activity at several mines near that city. The Thunder Mountain mine has been worked by a crew of 12 men during the winter, and they have extended a tunnel 640 ft. At present, the men are driving to cut the Champion vein at the mill-level. The tunnel will tap the lode at a depth of 400 ft. Rich ore that has been encountered, and one dike of low-grade free-milling ore has been found.—— Sixteen men are working in the Buster mine, near Elk City, and reports show that good ore has been encountered. This mine is owned by Frank W. Bradley.——The Frank Bush mine, on Red river, near Elk City, is being developed by the owners, Charles Whipple, J. Hillyard, and Frank Bush. Good ore is being taken out and reduced by a new mill, an invention of Mr. Whipple's.—— A three-drill compressor has been installed on the Twin Butte property, near Elk City, and is used in driving an 800-ft. adit. The surface showing on this property is good.

Lewiston, March 7.

(Special Correspondence).—Advices from Grangeville predict a rush into the Buffalo Hump country in Idaho this spring. This is due to repeated reports from prospects and partly developed properties, of rich strikes made since the district was closed for the winter by the heavy snowfalls. Los Angeles and other parties are buying stock, and the controlling interest in several of the properties.—— The Pierce City district is also going to be an objective point for many miners this spring. Last season's placer work was productive. The dredge near Pierce cleaned up on an average about $150 per day during the working season.—— Joseph Kieder, superintendent of the McKinley group of mines on the Salmon river, near Lucile, reports that a force of men has been kept at work on the property all winter exploring the four veins, and that a one-stamp test-mill has been busy every day. Each of the four veins has a width of three and one-half feet, and carries free-milling gold ore. More than 1,200 ft. of development work has been done. A five-stamp mill will be installed on the property next summer.

Spokane, March 11.

LATAH COUNTY.

E. F. Powers, and Dr. Haverson, of Palouse, and Frank Davidson, of Spokane, have bought the placer and quartz claims of Adam Carrico on Gold creek, 18 miles east of Palouse, in the Hoodoo district, and will begin work at once. Preparations are being made to take a force of men into the district and begin opening the properties. There is an eight-stamp mill on the quartz claim, and two hydraulic giants on the placer claims, and these will be put to work.

SHOSHONE COUNTY.

(Special Correspondence).—Five hundred thousand dollars was the price at which F. A. Heinze and his associates obtained control of the Stewart mine. There has been a complete reorganization of the company and new officers have been elected. The directors are: Charles Leonard, Butte; Stanley J. Gifford, New York; Edward J. Carter, Spokane; M. W. Bacon, Butte, and H. F. Samuels, Wallace. F. O. Merriam is general manager.

There are 85 men on the payroll. All the old equipment will be torn out and new put in. The air-compressor and all other machinery will be run by electric power, furnished by the Washington Water Power Co.——The Monarch Mining Co. reports that its ore-shoot is developing. Work has been done on what is known as the Atlantic vein, and with every foot or depth the ore-shoot increases in length.——A shaft has been sunk from the apex of this ore-shoot and 600 ft. of development work has been done from the shaft. The main level is 340 ft. below the surface. From the main level a winze was sunk toward the 490-ft. level and a raise was run meeting the winze from the 150-ft. level. The raise and winze show galena all the way. At a depth of 1,400 ft. below the surface, a tunnel 3,260 ft. in length, has been run and when

this tunnel strikes the vein, if the ore-shoot continues to lengthen, it should show a length of about 1,000 ft.——The Legal Tender Mining Co., which owns a group of 16 claims below Osburn, reports that a stringer of native copper 18 in. wide has been cut on the property. The find was made on the lower tunnel, which is in 300 ft.——The main vein on the Iron Crown property, east of Mullan, has been broken into and cross-cut for six feet without exposing the second wall. The tunnel is in 800 ft. and has attained a depth of 600 ft. The vein shows high-grade copper ore.——John Curran, manager for the Iron Spar Mining Co., states that ore, rich in copper, lead, and silver, has been encountered in the lode on which a drift has been run for 149 ft. The cross-cut was driven 181 ft. before it cut the vein.——Reports from Mullan are that a second strike has been made in No. 2 level on the Independent Mining Co.'s claims, Snowstorm Hill, between the Lucky Calumet and the Copper King. The vein is said to be a continuation of the Snowstorm-Snowshoe lode, is 10 ft. wide, has perfect walls, and is filled with quartz, galena, and copper-stained vein-matter.

The lower tunnel on the Lucky Friday mine owned by Spokane people, is in 172 ft. It is a cross-cut and will be 550 ft. long when completed. Three shifts are kept at work and the average is five feet per day by hand, but the company has ordered electric drills, which will make 10 ft. per 24 hours. These drills have been used exclusively in Colorado, but not yet in the Cœur d'Alenes. Electricity will come from the Washington Water Power Co.'s line. In the upper workings there is a shoot of ore 150 ft. long, which in some places is two feet wide. The property is near the Gold Hunter mill above Mullan, and adjoins the Gold Hunter mine.——Kennedy J. Hanley has bought a block of ground 2,200 by 4,500 ft., near Mullan, the tract including the Gettsbury, Independence, True Blue, War Dance, Victor, and Buckley claims, upon which $60,000 has been expended in development work. There is a tunnel in about 1,400 ft. on the east side of Mill creek. This is a cross-cut and was run to cut the Morning vein. This tunnel will be in the Morning vein after driving 400 ft. farther. This will be at a depth of 350 ft. below No. 5 tunnel on the Morning mine.

Spokane, March 10.

KANSAS.

CHEROKEE COUNTY.

The lead and zinc producers of this district are deriving much satisfaction from the policy now pursued by the smelting companies in paying the regular price per ton for zinc ore containing as much as 7% iron. Such ore was formerly penalized for its iron contents. The European smelters have for some time made a practice of deducting nothing for iron contents running as high as 4%, and the adoption of a similar policy by domestic smelters would appear entirely reasonable in view of the improved methods of smelting, by which the iron is saved and turned to account. Last week's shipments of zinc ore from this district were the largest in the history of the camp.

MONTANA.

PARK COUNTY.

The chief mineral district of this county is near Jardine, formerly called Bear Gulch, where the Kimberley Gold Mining Co. has its property and plant. This company has over 16,000 ft. of work done, principally in the way of tunnels, varying in length from 250 to 900 ft. The veins in the upper workings lie flat and the ore occurs in chambers. The formation is schist and shale, and the strike of the veins east and west. The output of the mine is treated in a 40-stamp mill and cyanide plant, which will be enlarged. The mine is now in shape to produce 700 tons of ore per day. There are 80 men employed at the property.—— The Crevasse and Helena Chief mines are situated four miles east of Jardine, and are owned by W. G. Conrad. The mines are opened by a 1,200 ft. tunnel, 30 men are employed, and a 20-stamp mill is treating 700 tons per month.—— The Buffalo-Montana is an old property situated at Cooke, 65 miles east of Gardiner. This mine has been idle for years, but now the old workings are being cleaned out and re-timbered, and development work is being pushed. The old smelter, which has been idle for 20 years, has been blown in, and is treating about 50 tons of dump material per day. The company is employing 100 men. Charles Eaton is the superintendent, and N. P. Trendennick is the foreman.

NEVADA.

ESMERALDA COUNTY.

Various reports continue to come from Goldfield concerning the labor troubles. One man has been murdered for his hostility to the I. W. W., and the mine-owners declared their intention to drive this organization from the camp. The business men organized and the mines closed down for two days to allow the men to join in an anti-I. W. W. parade, which, however, did not take place. All stores were closed, and skilled workmen and business men declared themselves supporters of the A. F. of L. Citizen's committees decided that none of the mines of the Goldfield district should be opened until the entire question of unions is settled, and that no member of the I. W. W. should be employed in the district as a miner, or in any other capacity. The wage-scale question has not arisen, and workers and

Montana.

operators state they are satisfied with the present schedule, but the result of it all has been that the mining business has been greatly disorganized and many miners are leaving the camp.

LINCOLN COUNTY.

(Special Correspondence).—New strikes are reported at Camp Thurman, a few miles southeast of Searchlight. The vein-matter is a honeycombed quartz, and specimens show free gold.——The first strike reported was that of John Thurman, who has a three-foot vein of quartz running well in gold. This was encountered on the Red Light claim. On the Jumper group, Harris and associates have encountered similar ore on another lode, and farther to the northeast Jesse Oliver has a good showing on the Christmas Gift, a claim presented to Oliver by a prospector last fall. Adjoining the Christmas Gift, William Unroe has opened an outcrop of quartz that within 10 ft. of the surface shows some free gold. These are some of the best surface showings encountered in the Searchlight district.——This district was discovered by John Thurman last September, and created excitement at that time owing to the surface showing on the Lloyd-Searchlight. This outfit has a shaft down 50 ft. and has driven a short distance in both directions on the vein. A mill-run at the Duplex last week gave returns of $75 per ton. This rock comes from a four-foot vein and was taken from wall to wall. The shaft will be continued down to water-level.——The Locke property, which adjoins the Empire, has let a contract for 100 ft. of sinking, and other contracts are to follow. This property has an excellent surface showing.——All of the recent strikes lie in an area a mile square, extending from the Empire on the south to the Nagle Buena Vista and Lloyd-Searchlight on the north.——Workmen are rushing work on the addition to the Quartette mill, and the next 10 days will see 20 stamps added to the present plant of that number. The additional batteries are being

mounted on the east side of the present mill, on concrete foundations. During the past year good ore reserves have been blocked out, principally on the 800 and 900 levels, where an ore-shoot 50 ft. wide was opened. The company has maintained a regular output of about $65,000 per month, and with the additional stamps this property may produce $1,000,000 per year.——Renewed activities in the Huntington properties promise to add materially to the payroll of the Searchlight and Crescent districts. These properties include the Denver Searchlight, the Superior Nevada, Crescent Searchlight, and Missouri Searchlight.——On the Denver Searchlight the shaft will be sunk to a depth of 400 ft. This will be a vertical shaft, and through it the development work will be done.——Development work will be done on the Jewell group at Crescent, where ore running $100 per ton has been encountered.——On the Superior Nevada there is good ore showing in trenches, shafts, and other workings. The 40-ft. shaft on this property will be sunk to the water-level. In the surface workings some mill-ore is shown.——The Crescent Searchlight will let a contract for 100 ft. of sinking on the Valley Ross. Water is expected at 100 ft., and the additional 100 ft. will be added to a 22-ft. shaft that has penetrated an ore-shoot 15 ft. wide.——The Missouri-Nevada Co. has acquired two claims east of Searchlight, adjoining the Golden Crescent and Horn of Plenty groups, two claims in the Crescent district, known as the Jack Pot and Golden Tom, adjoining the Mexican mine, and one claim at Camp Thurman, adjoining the original Thurman strike and the Nagle Buena Vista. Its Eastern office is at Sweet Springs, Missouri.

Searchlight, March 18.

LYON COUNTY.

Following many reports of a million-dollar cash deal for the Ludwig mine at Yerington, comes the news that no money was paid in the affair and only on option was secured. The latest reports state that Max Junghandel, a wandering prospector who followed the boom days in Goldfield, Manhattan, and other camps, has not been able to handle his option and has turned it over to F. J. Hagenbarth.

WHITE PINE COUNTY.

Excavation for the concentrator foundation of the Steptoe plant at McGill is about completed. About 500 ironworkers will be brought from Pennsylvania to work on the structure. There are already about 450 men employed at the plant, which will treat ore from the Nevada Consolidated and the Cumberland-Ely properties.—— The newly organized stock exchange will soon open at Ely.—— The shaft of the Ely Witch is down 115 ft., and the south drift is 586 ft. from the main tunnel. Some sulphides have been encountered.——Only 520 ft. of tunneling remains to be done to complete connection between the Ruth and Star Pointer workings of the Nevada Consolidated. Stations are being cut at the bottom of the Star Pointer shaft, for ore-pockets, and surface bins are being built.

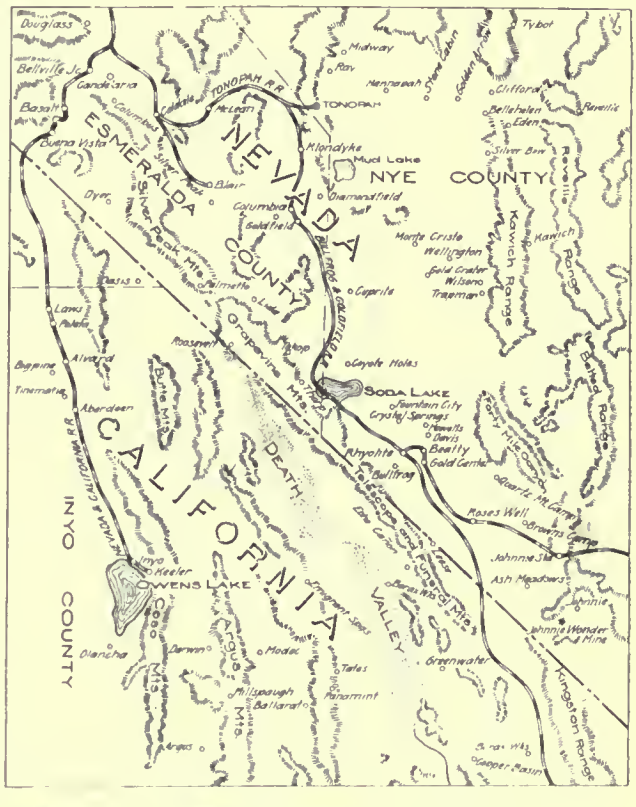
The diamond-drill on the Giroux property at Ely has struck good copper ore in the 1,000 ft. cross-cut, 108 ft. from the Alpha shaft.——The stock-pool of the Ely Consolidated company which was to have expired this month, has been extended for another year. Development work has reached the 390-ft. point in the Brilliant shaft of this company.—— The Bonanza group of claims, south of the Giroux property, has been sold for $20,000 to Hermansen & Sherrerd.——At Dolly Varden and Cherry Creek, things are looking well. The Victoria shaft is in sulphide ore.——The old Paymaster tunnel of the Nevada United Mines Co. at Ward has been cleaned out and re-timbered for 2,000 ft., which leaves 1,200 ft. to go to get to the breast of the tunnel, where cross-cutting will begin. Charles C. Gates is the superintendent and 25 men are employed.——A pumping-plant with a capacity of 325,000 gal. per day will be installed to work against a 1,500-ft. head at the Alpha shaft of the Giroux Con. company at Kimberly. The Giroux smelter is completed, except for the stack.——The Amalgamated Nevada M. & P. Co., has signed a contract for the machinery for a 100-stamp mill to be built on Baker creek. The mill will treat ore from the mines at Blackhorse and Osceola.——The final payment of $35,000 has been made on the Tip Top group, and these claims have been deeded to the Ely Central company.

OREGON.

BAKER COUNTY.

J. A. Howard, Kenneth McEwen, and John Arthur, of Spokane, have purchased for $15,000 a group of five claims known as the Poorman group, on Coin creek, in the new copper belt east of Baker City. Development work has already been begun. They have bonded the property to Detroit people for $25,000. The surface-ore on the group runs from $10 to $15 in copper.

On the Big Elk group of claims, near Granite, ore has been encountered assaying well in gold.—— The Daines Co., near Greenhorn, is working a force of men on their Belcher property, and the district is reported as being active.—— The Worley Co. has arranged to mill its ore at the Humboldt mill.—— The Standard Consolidated Co., operating in the Quartzburg district, is to ship a carload of cobalt ore to Thomas A. Edison. A 100-ton plant is in operation, and two carloads of cobalt concentrate per month have been contracted for. This is said to be the first shipment of



Map of the New Mining Districts of Nevada and California.

cobalt ore from a mine in the United States.—— At the Black Jack property, near Granite, the Congress vein has been cut on the 800 level, and drifts have been run each way on the lode. The adit at this level is now in over 2,300 ft., and will be continued to the Senator ledge.—— Charles Parker, lessee of the Pyx mine, took out $75,000 in gold during the past six months.—— A small crew is working at the Psyche. The 10-stamp mill will soon be started. W. W. Elmer is the superintendent.

JOSEPHINE COUNTY.

The Wounded Buck, in Josephine county, and the Forest Creek, Blossom, and No Name mines of Jackson county have all been merged into a new company, capitalized at $2,000,000.——The Harms company has recently purchased several properties which will be worked under E. T. Staples, the superintendent. New York and Cincinnati parties are interested.

LANE COUNTY.

There is a good deal of interest taken in the agitation to make the Bohemia mining district a part of Lake county, instead of standing as it does, part in Lane and part in Douglas counties. As many companies have their mine in one county, and mill in another, and the county seats are 70

miles apart, a great deal of unnecessary work is required of the operators to pay taxes and file papers in both places.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Colville M. & S. Co. has been incorporated to develop the Mountain Boy, Mountain Boy Fraction, Little Girl, Silver King, Copper King, and other claims in Park City, in the south half of the Colville reservation. The first shipment of ore from the Mountain Boy claim was 3,700 lb., which netted $637 over transportation and treatment. The present management shipped a carload of ore from the old dump which assayed 52 oz. silver per ton. The vein strikes northeasterly and pitches northwesterly. It has been opened by two cross-cut adits. From the No. 1 adit an inclined winze was sunk 170 ft., and lateral drifts were driven on the vein, following a rich streak of ore, from 4 to 18 in. wide. An adit was driven through the underlying limestone 265 ft., which did not reach the vein, but a connection with the incline was made by raising for drainage and ventilation. An adit is now being driven on the northwest side of the hill that will have to go 700 ft. to strike the vein at a depth of 330 ft.——The shaft of the Bootle Copper-Gold Co., on Belcher Mtn., is down 60 ft. to the foot-wall; a drift to the southwest is in 20 ft., and a winze down 15 ft., from the bottom, all in ore, which averages 2% copper. About 500 tons of ore has been mined and placed on the dump. The width of the vein cannot be surmised at present. The ore is iron sulphide. The company is employing 20 men. They have driven the No. 1 Belcher adit 60 ft. into the Bootle ground, and, as soon as the vein is encountered on that level, a raise will be run to connect with the winze. The vein strikes northeast-southwest and pitches about 50°. The collar of the Bootle shaft is 170 ft. above the No. 1 Belcher adit. This company recently purchased the Old Maid and other claims adjoining its original property on the southeast and is driving a cross-cut adit to tap a vein of iron-sulphide ore, which is supposed to parallel the Belcher vein.——At the Copper Key mine a connection has been made between the middle, or No. 2, adit and the bottom of the winze which goes down from the upper working, by a raise 40 ft. high. This mine has produced and shipped over 3,000 tons of ore, and there is much ore blocked out. The mine is now in better condition than ever, and shipping will be resumed as soon as the Belcher Mtn. railway resumes operation. It has been snowed in during the winter.——At the Winnipeg mine an adit is in 800 ft., and a survey has been made for a connection with the main shaft, at a depth of about 300 ft. The shaft is down to the 200-ft. level. Stringers of quartz containing chalcopyrite, similar to ore in the upper workings, have been crossed by the adit.——The Anonymous Mining Co. is following a good-looking vein of iron-sulphide ore from its lower adit.——The Oversight M. & M. Co. has done a large amount of surface prospecting during the winter along the supposed trend of the veins of the Oversight group. The Pin Money shaft is down 60 ft. on the vein, which pinched, but is again widening. A sample from across the vein assayed 2.45% cobalt, 2% copper, 44% arsenic, 25% iron, and 20% sulphur in addition to other constituents.

Republic, March 20.

OKANOGAN COUNTY.

The Molson Gold Mining Co., operating in the Okanogan country has placed orders for a 9 by 24 roll breaker, nine 1,200-lb. rapid crushing, quadruple-discharge, stamp-mills, with feeders, line shafting, pulleys, and belting; one No. 3 Merralls roller mill, with silvered-copper amalgamation plates for saving the free gold; a 50-h.p. steam-engine, boiler and accessories. The contract price for the equipment is $12,549, exclusive of $5,000 for installation.——The Mineral Hall company, near Conconully, will start driving on the last two veins cut in the tunnel early in April, and the ore will be shipped to the smelter at Grand Forks, B. C. From the mine the ore will be hauled by wagon to the railroad on the Similkameen river, which should be in operation to that point, by that time. The veins from which the ore is to be extracted run high in lead and silver.

SKAMANIA COUNTY.

D. D. Birks, of the Spokane Lead Mines Co., has returned from Metaline camp. He said that the workings of the May Bell claim are down 75 ft. from the surface. They have cross-cut a body of concentrating galena-ore for 35 ft. The width of the vein is probably 30 ft. On the hanging wall a drift has been run for 68 feet.

WYOMING.

ALBANY COUNTY.

Placer operations for gold are being planned on an extensive scale for the placer fields along Douglas creek in Albany county. It has been demonstrated that the district is rich, and a number of dredging companies are ready to undertake active operations. The American Gold Placer Mining Co. will install a powerful dredge; and in view of improvements in placer mining methods, it is likely that important results will be effected.

BRITISH COLUMBIA.

The following is the tonnage of ore shipped from and crushed at the Rossland mines for the week ending March 9: Centre Star, 1,920 tons; Le Roi, 2,415; Le Roi No. 2, 420. Total, 4,775 tons. The Boundary ore shipments for this week were: To Granby smelter: From Granby mines, 15,333 tons; from Emma, 60 tons. To B. C. Copper Co.'s smelter: From Mother Lode, 2,000 tons; from British Columbia mine, 530 tons; from Snowshoe, 600 tons. To Dominion Copper Co.'s smelter: From Brooklyn, 1,952 tons; from Rawhide, 1,408; from Sunset, 768; from Mountain Rose, 105 tons. To Trail smelter: From Snowshoe, 730; from Providence, 60 tons. To Nelson smelter: From Emma, 70 tons. The total shipments for the week were 23,616 tons, and for the year, 147,008 tons.—— During the week the Boundary smelters treated ore as follows: Granby smelter, 13,144 tons; British Columbia smelter, 3,831; Dominion smelter, 4,233 tons, or a total treatment for the week of 21,208 tons, and for the year, 142,438 tons.

On the 14th level of the Centre Star a station has been cut, and sinking toward the 15th level has started. When it is reached, the distance from the collar of the shaft will be 2,050 ft., or about the level of the Columbia river at Trail, and should be the water-level in the mine. The three electric locomotives for underground haulage in the Centre Star and allied mines have arrived and will soon be running. In the Centre Star stoping is going on in the 4th, 7th, 8th, 11th, and 12th levels. In the War Eagle, stoping and development is going on in nearly all the levels, while in the Iron Mask stoping and driving are confined to the 4th level. The development of the Idaho is progressing through the 4th and 12th levels of the Centre Star. The conveyor is operating in a satisfactory manner, and the rock-breaker is crushing all ore sent from the Centre Star and its allied properties, to the smelter.

MEXICO.

CHIHUAHUA.

The production from the camp of Parral for the week ending Feb. 23, was as follows: Shipped to smelters, 2,750; locally treated, 1,950 tons. The camp produced 10,895 tons during the month of January.——The Green G. & S. Co. is to change its headquarters from Temosachic to Concheño, which will make them near the Concheño-Navidad mines, the principal property of the company, and nearer the Ocampo, Pinos Altos, and a number of other properties.—— The Santa Barbara section of the Parral district has now 27 working mines, more than at any other time in the history of the camp.

SONORA

A new concentrator of 10,000 tons capacity is to be built at Cananea for the Greene Consolidated and Cananea Central properties. The present capacity of the two units is about 2,400 tons per day. The new mill will be entirely of steel, resting on a concrete base, and will be so arranged as to enable the ore to be handled by gravity. The present ratio of concentration is about 3.6 into 1, and this rate will be maintained in the new plant. L. D. Ricketts, formerly superintendent of the Old Dominion plant at Globe, will design the new mill.

Special Correspondence.

Georgetown, Colorado.

Activity in Clear Creek County.—Strikes in East Argentine.—The Tobin Gets Rich Ore.—In Peruvian District.—The Wilcox Adit.—New Concentrator for the Jewell Co.—The Sidney Adit.—Lessees on the Bismark.—The Ramsdell Mill.—Ore in the McKinley.—Annie May and Mazeppa.—Sale of the Lebanon.—Other News.

The State Commissioner of Mines, E. L. White, has issued a statement giving the metal production of the counties in Colorado during the year 1906 as compiled by the Bureau of Mines:

THE MINERAL PRODUCTION OF COLORADO FOR THE YEAR 1906.

County.	Gold.	Silver.	Lead.	Copper.	Zinc.	Total.
Boulder	$254,034	$34,082	$3,194	$4,36[illegible]	.....	$295,678
Chaffee	56,901	44,397	42,298	143,295	$38,672	325,569
Clear Creek	458,522	407,891	153,837	52,515	107,440	1,180,208
Custer	16,432	50,938	6,437	2,115	60	75,981
Dolores	20,690	31,197	34,399	39,335	54,761	180,383
Eagle	44,791	55,475	21,773	8,792	88,385	219,218
Fremont	5,250	102	10	70	.....	5,433
Gilpin	1,185,186	161,294	25,358	131,312	2,851	1,506,302
Gunnison	42,700	61,197	13,122	2,767	9,805	169,593
Hinsdale	21,724	48,207	47,230	10,696	2,379	130,238
Lake	1,055,472	2,997,079	2,557,808	776,613	4,350,900	11,737,874
La Plata	308,148	81,426	94	36	.....	389,705
Mineral	176,149	837,597	795,973	.....	179,249	1,988,971
Ouray	984,450	609,200	305,933	127,641	3,401	2,030,627
Park	409,472	44,333	33,591	14,696	.....	502,096
Pitkin	6,531	1,443,177	939,070	55,009	203,090	2,646,877
Saguache	3,079	11,545	9,725	3,572	4,605	32,527
San Juan	834,303	460,119	221,343	403,694	44,513	1,963,973
San Miguel	2,541,686	986,487	376,377	61,630	.....	3,966,182
Summit	169,659	86,890	79,245	4,383	208,484	548,663
Teller	13,930,525	45,379	163	.....	.....	13,976,069
Total	$22,588,734	$8,499,743	$5,666,993	$1,844,002	$5,298,602	$43,899,075

In the above table the calculation is on the average market price of the minerals for the year. Gold, 20.67; silver, 0.66791; lead, 0.05347; copper, 0.19278; zinc, 0.06198. The zinc figured on actual spelter recovered. Eighteen counties that contributed slightly are omitted.

Cripple Creek is in Teller county, Leadville in Lake, Creede in Mineral, and Aspen in Pitkin. The San Juan region comprises San Juan, San Miguel, Ouray, Dolores, La Plata, and Hinsdale counties.

East Argentine comes to the front this week with one of the most important strikes ever made in the history of Clear Creek county mining. In running the lower level on the Tobin, a body of ore has been uncovered which measures from three to five feet wide, assays showing 2,02t oz. silver per ton. The ground has been opened for 240 ft. in length and the ore-shoot extends for the entire distance. The ore was lost a few weeks ago, but it was later determined that it was on the foot-wall. The Tobin was recently sold to a syndicate of English capitalists, and it is estimated that there is now blocked out $2,000,000 worth of pay-ore.——A rich strike has been made on the Star property, situated in the Peruvian district, better known as the Horseshoe. In running an adit to intersect the Star vein, a blind lode was cut at a distance of 95 ft. from the portal. A six-inch streak of ore is exposed that assays from 1,000 to 1,500 oz. silver and from 15 to 20 oz. gold per ton, with 20% lead. The adit is being driven forward in order to reach the next lode, which lies 150 ft. distant. The Star lode is an extension of the Revenue, which has produced in excess of $1,000,000.——On the Commonwealth vein in the Wilcox adit, a body of ore measuring from four to five feet wide has been followed for the last 1,400 ft. Recent shipments show net returns averaging $125 per ton in gold, silver, lead, and copper. Stoping is in progress and a height of 400 ft. has been attained. All indications are that the shoot will go through to surface, a distance of 300 ft. more.——Three feet of 292 oz. silver-lead ore has been uncovered in a stope being carried on the Sunburst. The ground has been opened for 80 ft. in length, but it is evident that the streak will run for a good distance farther. Heavy shipments are in order and a record-breaking production is being made. A. B. Montgomery of Denver is resident manager.——The new concentrator of the Jewell Mining & Leasing Co. was started this week. The mill has a capacity of 50 tons daily and is being fed upon dump-matter from the upper Mendota workings. The first shipment has demonstrated that the entire product can be handled at a good profit; by running from four to five tons into one, returns of $38 per ton are being received from the lead concentrate.——Driving is in progress on three lodes intersected through the Sidney adit, East Argentine. In the drift run south on the New York vein, a big body of mineralized quartz is being followed, with every indication that ore in paying quantity will be discovered shortly. The machine-drills are to be put to use again early the coming month, at which time better headway will result, both in the adit itself and in the drift.——Six inches of high-grade ore has been uncovered on the Bismark vein, being worked under lease by Otto Schatz & Co. The strike was made in running south from the point where Jos. Ebner & Co. started a cross-cut north. The ground has been opened for 20 ft. and the ore has been found to be continuous. Assays show 250 oz. silver per ton.——Work is being crowded to the limit on the Ramsdell mill, situated near the base of Lincoln Mtn. The buildings will be completed within two weeks, while the installation of machinery is under way.——Seven feet of ore has been encountered in the breast of the adit on the McKinley, situated on Lincoln Mtn. Assays yield from $9.40 to $17 per ton in gold, silver, and lead. D. W. Crandall, the manager, left this week for the East, where he will consult with stockholders concerning the erection of a 25-ton mill.——Ten inches of 330-oz. silver ore has been exposed in the workings of the Stemwinder. The ore is a decomposed sulphide and the discovery was made in sinking a winze 60 ft. from the portal of the adit. Driving is now in progress and as far as the ground has been opened the streak is still showing. Shipments were commenced this week to the local sampler.——A fine showing is being made on the Annie May, situated on Columbia Mtn. The cross-cut being driven to intersect the group has cut the first lode and a six-inch streak of sulphide ore is showing. Assays show 40 oz. silver per ton. E. E. Grubb, the manager, states that work will be resumed this week in the driving of the adit on the Annie May lode.——The Mazeppa vein has been intersected by the cross-cut being driven by the Mazeppa Mining Co. Scattered mineral is showing, and as soon as the heading has been advanced far enough, driving both east and west is to be begun. Manager M. Jacoby purposes continuing the adit ahead for at least 500 ft. more.——A company backed by Denver men has been organized for the development of the Paris group of claims, situated on Griffith Mtn. The bore is now in a distance of 500 ft., and it is believed a cross-vein will be reached with the shooting of any round of holes. The Paris vein was cut a few weeks ago by the Crowfoot drift being driven by the Capital Prize Mining Co., and ore measuring from two to three feet wide was uncovered. Tests show two ounces of gold, 30 oz. silver, with about 10% lead. It is probable that arrangements will be made for the working of the ground through the Crowfoot drift, as an increased depth of 1,000 ft. will be attained. Joseph Raymond is the manager fot the company.——Development work is being pushed forward on the Lebanon property, situated on Republican Mtn. A raise is being put through from the tunnel-level to make connection with the Everett workings, and an 18-in. streak of good-grade ore is being followed. The ore shows wire silver, and brings returns averaging about $60 per ton. It is understood that this property has been taken over by a syndicate of New

York capitalists, and that work upon a 50-ton concentrating plant will shortly be under way. The consideration is given as $80,000. W. H. Maxton is manager.——The Main Gulch Mining Co. is sending forth a heavy tonnage of high and medium-grade ores from the Smuggler group, situated on Brown Mtn. A number of leases have been granted during the past three weeks, and all the men are in pay-ore. C. I. Burt, of Silver Plume, is the manager.—— A contract has been awarded by Rees C. Vidler for driving the lower adit on the Arapahoe vein an additional 200 ft. This should take the heading under the rich pocket of ore that was extracted from the level above.

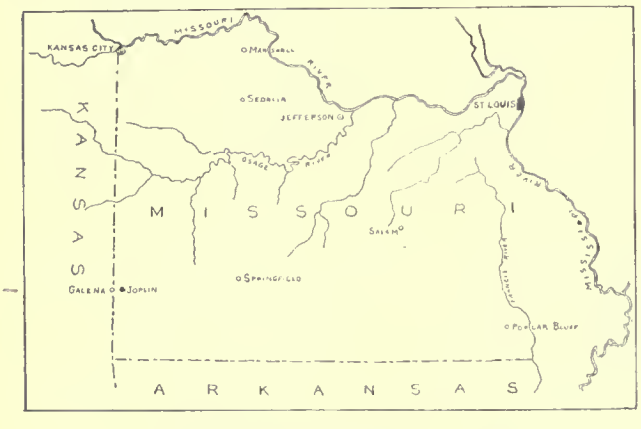
Joplin, Missouri.

Lead and Zinc Ore Prices.—Increasing Production.—Successful Drilling Operations.—New Shafts and Mills.—General Activity.—Expansion of Productive Area.

The highest price reported paid for zinc ore in the week ending March 9 was $53.50 per ton for some choice ore on the Continental Zinc Co.'s land in Joplin. The highest price paid for lead ore was $85.50 at Granby; $85 was paid in Webb City and $84 in Joplin. It is estimated that the smelters have $340,000 tied up in ore in the bins throughout the district, which they cannot move for lack of cars. There are over 200 cars of ore in the bins, the largest part of which is in Webb City and Carterville; Alba and Neck City are suffering seriously from the car shortage and much ore is piling up; the same condition exists at Orongo and Aurora.

Shipments.	Zinc Lb.	Lead Lb.	Combined Value.
March 9	12,297,000	1,912,030	$381,743
Year to date	116,610,670	16,582,380	3,431,154
Same period, 1906	99,594,820	14,135,120	2,758,395
Increase	17,015,850	2,447,260	675,759

Shallow lead is being mined on the Rob Roy lease just west of the Rex Mining & Smelting Co.'s land east of



Sketch Map Showing Position of Joplin.

Joplin. Burt Lyon and J. A. Wilson are doing some drilling on the south end of the lease, where there has never been any prospecting, and it is thought they will connect the rich run of ore between the Ideal mine on the Rex land and the Bumblebee on the Shewmaker tract.—— The M. K. & T. mine at Baxter Springs is keeping steadily in operation and making a splendid weekly turn-in of ore. The consolidation of this property with the Ward mine and the installation of an additional capacity of 600 tons per day, will make a big showing for that camp. Don McRuer is manager of this property. The Blue Bird is another very promising property in the Baxter Springs camp. It is owned by Ginder & Kraft; the ore was encountered at a depth of 55 ft., showing a 14-ft. face of lead.

At a depth of 101 to 109 ft. lead has been found in a drill-hole on the Shepherd tract east of the Rex Mining & Smelting Co.'s land east of Joplin and a shaft will be sunk at once. Harry Mead, and others of Joplin, are interested in the new find.——H. L. Kramer and son, of Cascaret fame, are planning extensive developments on their property at Carl Junction. They are sinking one of the largest shafts ever put down in the district, and are now letting the contract for four 400-ton concentrating plants to be erected on the property, work to be begun within two months. The son is residing in Carl Junction with the superintendent, Mr. Steel, who is in charge of the work.

The Ideal Mining Co. has made another rich drill-strike on their lease on the Rex land east of Joplin. The new discovery is the third drill-hole that has found good ore on this lease within the past three weeks and demonstrates that the Ideal has one of the largest deposits of ore found in soft ground for a number of years. The record of this mine in the past six months has been almost phenomenal, as it has paid all operating expenses with the lead ore that has been produced, leaving all zinc ore as net profit, which has amounted to from 50 to 60 tons per week. Messrs. McAntee and associates of Mt. Vernon, Ill., have purchased the mill and lease of the John Durby Mining Co., operating on the Burgner land, south of Carterville, and will at once begin to open up the ground in a thorough and systematic manner. There has been much work done in this mine, but it never paid dividends under the past management.

The Porto Rico camp, lying between Prosperity and Duenweg, southeast of Webb City, furnishes one of the best examples of the rapid development of mining territory to be found in the district. But eighteen months ago the only producing mines in that immediate vicinity were the three or four on the north end of the Porto Rico tract, more generally known as the Ground & Irwin lease, while today there are between fifteen and twenty big modern mills turning out ore at a lively rate, while as many more shafts are being sunk, opening up ore for more mills next year.——The recently organized Hawkeye Zinc Mines Co. has purchased the 20-acre lease of the Lyon Mining & Development Co. on the Connor land south of Carterville, and will soon begin the erection of a 300-ton concentrating plant at the shaft on the south ten acres, which Mr. Lyon put down to the sheet run of ore. This property ought to become a good producer.

Mexico.

The Explosion at Las Esperanzas.—News From Guanajuato.—Good Ore in the Carmen.—Railroad Building.—Transfer of San Cayetano.—Batopilas Output Increasing.

The removal of the debris after the explosion on February 18 at the No. 3 shaft of the Mexican Coal & Coke Co. mines at Esperanzas, Coahuila, which resulted in the death of 67 miners, has shown the damage to be not nearly as bad as was at first expected, and it is believed that the output of the company will not be materially affected. Certainly it is to be hoped that this will prove so, for the shortage of both home and foreign coal has caused a practical coal famine at smelters and industrial institutions throughout the Republic, some having to shut down aud others to work at half capacity. What was the direct cause of the Esperanzas explosions, whether from gas or dust, has not been clearly shown, but whatever the cause of this most disastrous of all Mexican mine accidents, it should lead to more strict regulations for coal mining in Mexico. The Mexican is more or less of a born miner, as he is always poking around the hills, and very few indeed are the accidents in metal mines, but of the dangers of coal mining he is wholly ignorant, and it is remarkable that this is the first real disaster in the Coahuila coalfields. It will, no

doubt, lead to the enactment of strict laws and regulations for the future.

In Guanajuato, the great Sirena mine of the Guanajuato Consolidated Mining & Milling Co. seems to be improving with depth, the vein on the sixth level having opened up to a width of 81 ft., with an average value of 36 *pesos* per ton, and the development work during January opened up some 100,000 tons with a value of about 3,000,000 *pesos*. And in the Carmen mine, held largely by the principal owners in the Guanajuato Consolidated, a fine body of ore rich in gold has been struck in the adit being driven to connect with the Pinguico mine. This adit is already 2,500 ft. long and is in pay-ore all the way, but this recent strike is of bonanza grade. There is still 500 ft. to go to make the connection, and it is expected that pay-ore will be found all the way. The Pinguico people, to whose property the Carmen adit is being driven, have given a contract for the installation of the mines and being shipped to the smelters. The Pinguico is producing rich ore.——Good progress is being made in the Cuajin drainage tunnel that is being driven under contract with the State Government by the Engineering & Construction Co., of New York City. It is estimated that one more year will be required to complete the tunnel, which is 26 ft. in diameter.

The San Pablo Mining Co., of New York, has purchased two claims adjoining the San Francisco and Mirador properties, at Ixtlan del Rio, Tepic. This company now owns 50 *pertenencias* in that part of Tepic, in addition to the San Pablo mines in the Ezatlan district of Jalisco.

Bullion shipments of 105,000 oz. or nearly $70,000 for February seem to justify the policy of the management of the Batopilas mines in re-investing most of the returns for 27 years until there are more than 50 miles of underground workings including the Porfiric Diaz adit, 10,000

Map of Mexico.

a complete Butters slime-filtration plant for their cyanide mill.

The Southern Pacific railroad has started work on the Guaymas-Guadalajara extension out of Mazatlan, and about 1,000 men are employed. News comes that there are 2,000 carloads of construction material at the port of Manzanillo, awaiting shipment into the interior for the Manzanillo extension of the Mexican Central railroad.

The transfer of the San Cayetano mines in Guanajuato from the United Mexican Mines Association of London to the San Cayetano Mines Co., has been completed. The English association was at one time heavily interested in mines in Mexico, but has disposed of its properties one by one, until only the San Cayetano mines remained. The association will now go out of existence, while the purchasers of the property will proceed to develop the mines on a large scale. More power will soon be available for mining purposes in Guanajuato, as the Guanajuato Power & Electric Co. is taking up additional water-rights along the Duero river in the State of Michoacan, and an additional hydro-electric plant will soon be installed to meet the increasing demand for power.——A good deal of high-grade ore is coming from ft. long. Just now Batopilas is attracting a good deal of attention. Mr. Stewart Tod, the resident engineer, who is now in New York, says he will turn out at least $1,500,000 this year. It is claimed that, although the mines have produced more than 20,000,000 *pesos* since Alexander Shepherd took them over in 1880, the stock has always been closely held. It is soon to be listed on the New York Exchange. In spite of the distance from the railway, Batopilas has at the San Miguel *hacienda* a 100-stamp mill for high-grade ores and a 25-stamp mill for low-grade ores, and a foundry that can cast its own stamps of 2,500 lb. apiece. Development has been slow and expensive, but this property is now in a condition to produce heavily.

It is rumored at Torreon that the A. S. & R. Co. is again negotiating for the purchase of the Torreon smelter, on which it at one time had an option, which was allowed to expire. The capital stock of the Torreon smelter was recently increased to $5,000,000 and the company is in a prosperous condition.——A group of New York men have bonded 290 *pertenencias* in Santa Eulalia for 1,250,000 *pesos*. The option is for 60 days and covers all the property owned by Lorenzo Arellano and A. V. Garcia in

this district.——About 70 men are employed at the Cuadras and Marina mines in the Santa Barbara portion of the Parral district. These mines are owned by the Marina Mines Co., an English corporation. The properties are developed by a shaft 500 ft. deep, and the ore carries gold, silver, and lead.

London.

The Transvaal Government.—The Exploration Company.—A Good Annual Report.—El Oro and Mexico Mines.—Estimate of Ore in Esperanza.—Strike in the Dolores.—Deep Leads.—General Mining Market.

The main subject of discussion in the Kaffir market just now is, of course, the newly elected Government in the Transvaal. What will the dominant party do with their power? The prevailing attitude here appears to be that indicated by the phrase "waiting to see how the cat jumps." There is a pause perceptible in the air somewhat similar to what happens after the deliverance of an *enfant terrible* or a Buster Brown that has let himself go in a polite assembly, on a topic forbidden by his elders. The view was expressed in my correspondence months ago that a Boer majority might not be so detrimental to the mine owners' interests as many then feared. That opinion is shared today by some of the leading financial writers, one of whom aptly remarks that: "Less than eight years ago this country went to war because the Boer Government refused justice to British subjects engaged in mining on the Rand; and now these same British subjects are turning with relief from the ministrations of the unsympathetic British Colonial Office to a sympathetic Boer ministry, at the head of which will probably be found the general who led the enemy's troops against us in the field. History records many instances of topsy-turvy judgments; but never, perhaps, such an amazing reversal of opinion within so brief a period as this."

That adroit medicine man of the Exploration Company, Mr. R. T. Bayliss, had an unpalatable pill prepared for his audience at the stockholders' meeting last week, but he got them to swallow it with fairly good grace. Nearly £100,000 written off for depreciation on South African shares is a dose in the taking of which a grimace on the part of the patient is pardonable. In regard to other fields of operation the Chairman gave a more cheerful account. He was able to state that the shares held by the Company in Mexican mines showed an appreciation over cost of £88,366. Interests in other (American) mining companies contributed a gain of £10,414, and the investments made up to the end of the year in copper mining securities showed an appreciation over cost of £85,479. On balance, the securities showed an advance of £183,000 over their cost price. In dealing with the Company's mining operations, the Chairman referred to the developments in El Oro (Mexico) at the 1,000-ft. level as of first importance, the ore on the big San Rafael vein that had given out at the 500-ft. level having come in again at the 1,000-ft. R. M. Raymond (the general manager) is confident that what has now been discovered is going to make a permanent orebody. The face of the drift now being run north has sampled, on the 1,000-ft. level, from 10 dwt. per ton up to 100 dwt. per ton, and the latest information is that the whole face of the drift, 5 ft. wide, shows an average value on sampling of 2½ oz. gold per ton and is in sulphide ore. From the occurrence of this sulphide ore, it is thought that the water-level of the district has been reached, and, if so, there is the strongest encouragement for the belief that the ore will persist in depth. With regard to the Somera mine, the Chairman held out the hope that they would meet with good luck there, but the pick of their basket in that district was Mexico mines of El Oro, and that by reason mainly of its small capital of £180,000. The Mexico mine has improved during the past eighteen months in the most remarkable manner, and the Chairman said it has proved to be a property of great importance and value. They are getting, in branch veins and local enrichments, in addition to the main developments, a considerable amount of high-grade ore, which will average something over 100 dwt. per ton. It seems to be the characteristic of that El Oro district that in the little off-shoots or branch veins from the main vein ore is found in a highly concentrated form. Among their other investments in the United States, they controlled the Tomboy gold mine, which during the past eighteen months had been making remarkable progress, both in its development and in the gross profit per month, and they were sanguine that further development in depth would be of an encouraging nature. Then the Exploration Company had secured a large participation in what is known as the Nevada Consolidated Copper Co. From all the information regarding that property, it is believed to be a remarkable one. The property will not be in the producing stage before the end of this year; the investment at the present time shows a large profit, but their advices with regard to the future earning capacity of the Nevada Consolidated are so good that they are retaining their interest, in the expectation of realizing a handsome profit at a later date.

A cabled report is announced from Esperanza (Mexico), stating that the consulting engineer's estimate of ore reserves is 141,600 dry tons metric, which should yield an operating profit of $1,480,000; cash balance, December 31, $2,281,475; ore on hand and in transit, $1,427,741; supplies on hand and absorptions, $200,000 American money. By putting these figures together and deducting the dividend paid in January, amounting to $1,181,250, a net value is arrived at of roundly $4,000,000 for the mine at the end of last year, not including the upset price of the plant and machinery. The position thus revealed is the subject of some debate among stockholders on this side, who would very much like to know whether the expression 'ore reserves' in the report means every ounce of ore known or thought to be exposed in the mine, or whether it refers simply to ore blocked out and available for stoping, and, if in addition to the known value, there are possible resources in the unexplored or partially explored portions of the mine. For the speculator, the charm of mining is not so much in the known as in the unknown or dimly perceptible future. From this standpoint the Esperanza report lacks in attractiveness, and the look of an inventory given to it has had a depressing influence on the market.

The microscopic rich streak of 0.06 in. reported in the new strike at Dolores (Mexico) announced at the beginning of the month now turns out to be six inches, a wrong code word having been used for the width. The value of the discovery is confirmed by mail. According to the further report published, the new vein (which has 450 ft. of 'backs' to surface) is parallel to and lies between the Alma de Maria vein, and the San Francisco vein, which it is also expected to strike rich about 100 ft. farther in the same cross-cut. From all present appearances the net value of the mine as given in the last annual report must be regarded as an ultra conservative estimate. The profit for January from Dolores is given as $25,000, or over 50% of the gross value of the month's production.

Another enigmatic cable is published from Loddon Valley (deep leads) for the bewilderment of the unsophisticated layman. "Borehole 128, end 500-ft. level, shows drop 15 ft. in bedrock as compared with last bore-

hole, 150 ft. distant." The news is not calculated, probably, to elevate stockholders' spirits or the Company's shares.

At the opening of the new fortnightly account, the depression in mining markets is reported as continuing. For some time past mining shares have been saved from complete stagnation by the active interest that has been taken in a few specialties, such as Rio Tintos, De Beers, and one or two similar descriptions; but the demand for even these has now lessened, and the mining markets can boast merely a modest improvement in a few Siberian issues. Business in Kaffirs was on an extremely small scale, and in the morning the market displayed some weakness. Rio Tintos were heavily pressed for sale from the bourse in Paris on the unfavorable advices from New York, and fell at one time to nearly £100, while Cape Coppers and Tharsis were freely offered from the same quarter. A sharp fall also occurred, in Zinc Corporations, a movement which was likewise not without influence upon the mining market as a whole. As regards Westralians, the only improvement was in Great Boulders; but Horseshoes, Great Fingall, and Oroya Brownhill all weakened. Barriers were dull and lower, under the lead of Zincs, which were somewhat heavily sold both on home and colonial account. The sales from the Colony were regarded as significant, and the offering on this side was accompanied by renewed rumors to the effect that the Company's process is a failure.

Leadville, Colorado.

Lower Production Last Month.—The Little Johnny.—Important Discoveries.—Activity on Breece Hill.—The Vinnie and Fanny Rawlins.—Pumping the Mammoth.—A Geological Surmise.

The production of the camp during the past month was less than in any previous month for a long time and cannot be easily explained, but the usual activity at this writing indicates a normal production for March.

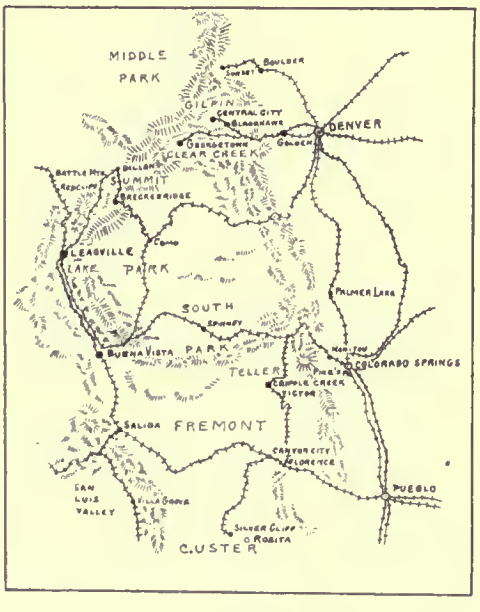
The Little Johnny mine still furnishes an occasional sensation. The recent strike of a body of copper ore in shaft No. 3 will, from present indications, furnish a substantial amount of that metal. In the past the No. 4 shaft has produced a fair supply of copper, but the new orebody is much more important. Even of more importance is the gold ore opened up on the 1,300-ft. level. It is impossible even after two weeks' development work, since the discovery, to give an approximate estimate of the value of the new ore-shoots. But pockets of ore running $100 per lb. and shipments of a quantity of ore with a net smelter value of over $100 per ton indicates its importance.

The different properties on Breece hill are all shipping ore. A few months ago, several Leadville miners took hold of the Elk, adjoining the Little Johnny and after installing a plant of machinery they started development work on the bottom level. A drift driven to the southeast has exposed a body of ore giving returns of $20 per ton and upward, and a steady production of 30 tons daily is being maintained.——Good progress is being made in sinking the Cleveland shaft, and the required depth will be reached by the end of March. The entire bottom of the shaft is in ore running $20 per ton; it is mostly galena. So far water has not been an important factor in sinking this shaft.

The lessees on the Fanny Rawlins are doing considerable work on the fifth level. Regular shipments are being made and the plan is to sink a winze to the St. Louis tunnel for air and to work the orebody at greater depth. The St. Louis adit has entered the Fanny Rawlins ground and exposed a strong ore-shoot.——The Vinnie is shipping 50 tons of ore daily and when connections have been completed with the Yak tunnel, the shipments will be increased. The discovery of a large body of exceptionally rich ore was made two weeks since, and the management reports this to be the most important discovery on that property for years.——The Crescentia, on Rock hill, has opened a body of lead carbonate of good grade and is shipping 25 to 40 tons daily.

The Triangle Mining Co. is conducting extensive development work both by drifts and diamond-drills. The manager, O. H. Fairchild, is not yet ready to give out information, but the north drifts are furnishing shipping ore. The results of the diamond-drilling will be of much interest to the public, as but little is known of the formations on that part of Breece hill. The Yak tunnel is being driven at the present with but one shift, but it is expected that arrangements will be completed at an early day to permit the adit to be driven into South Evans gulch to tap the ground of the Ollie Reed.

Machinery is being delivered for a power-plant on the property of the East Lake Mining & Milling Co. at the head of Lake creek. A dam is to be constructed and hydro-electric power employed for development work. Although the adit is now in over 1,200 ft. it will be driven at least 1,000 ft. farther before cutting the Washington vein.——Preparations are being made to resume operations on the Silent Friend, on Little Ellen hill. Since the property has been leased, arrangements have been made to install a modern plant of machinery. This mine has made a good record and the resumption of work should result in another shipper for Leadville.



A Part of Colorado.

While the large pumping plant is being installed on the Mammoth, the water is being bailed and at this writing is near the 400-ft. level. A station is to be cut at this point and ample pumping facilities provided, in anticipation of another flood such as caused the former company to abandon the enterprise.——For some time past, the probability of finding ore-shoots in the pyritiferous porphyry of Breece hill has been much discussed. This hill is known to have thousands of acres of such territory and but little prospecting has as yet been done to determine its value as an ore-bearing formation except a single shaft sunk on the Banker and a few hundred feet of driving by the Yak company. Many seams of ore exist so as to warrant the conclusion reached by the late August R. Meyer that below this mass of porphyry would be found important ore-shoots. The drilling now in progress at more than one point, should throw light on this subject.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

CRUSHING-ROLLS act upon the lumps of ore on the principle of the toggle joint.

BARYTES is used as an adulterant for white lead and is added to paper to give it weight.

THE Simplon tunnel is the longest deep tunnel in the world, being 12.4 miles in length.

MOST steel-makers agree that the cost of melting one ton of crucible steel is between $34 and $39.

THE original Blake breaker was patented in 1858, and gave the greatest movement at the mouth.

AROUND every conductor carrying a current of electricity, there is set up a magnetic field of force.

RIVETED PIPE is more widely used for a water conducting medium than any other kind of metal pipe.

THE leather industry contributed $150,000,000 to the foreign commerce of the United States in the year 1906.

A STAMP-STEM generally breaks just above the head and sometimes just below the tappet, the points of greatest strain.

GYRATORY BREAKERS act upon large, elongated lumps, on the principle of a beam supported at the ends and loaded in the middle.

THE Huntington mill is used to do the work of a stamp-mill in crushing gold ores, and often serves as a fine grinder for re-crushing jig-middling.

THE Kinkead mill is a pan-mill with a convex conical bottom or die, upon which operates a conical muller or shoe, of a gross weight of about 3,400 pounds.

THE tendency of the tappet is to push the cam away from the stamp during the act of being lifted, and this is greatest at the moment of leaving the cam, on account of the lateral thrust.

WE are asked whether quartz carrying gold in profitable quantity has been found in Placer county, California. Certainly; in many mines, particularly between Auburn and Newcastle.

THE correspondent who wrote to us concerning a vein of native arsenic in Mexico, will do well to write to the Slipp-Butler Co. at 45 Broadway, New York. They are dealers in arsenic and other metals.

IRON PIPE for conveying water to hydro-electric plants is rarely used in sizes larger than three or four feet in diameter. Cast iron is preferable to wrought iron, since it rusts less, and its life is practically unlimited.

WHEN water is admitted to only one part of the circumference of a hydraulic motor, the machine is termed a water-wheel. When water is admitted around the entire periphery of a hydraulic motor, the machine is termed a turbine.

THE Bay Counties Power Co., of California, has the longest transmission system in existence. Power is transmitted at 40,000 volts to Oakland, a distance of 142 miles from the main generating station, and to Stockton, 218 miles from the main power-plant.

THE steel in reinforced-concrete should be in comparatively small sections, well distributed through the mass. Wide flat bars bedded in concrete are not held as firmly as square and round bars of the same sectional area, and are not suitable shapes, for the reason that the concrete tends to shrink away from the flat sides.

IN mining bodies of native copper, it is the practice to cut the 'mass' with cape chisels having a ¾-in. bit, the successive chips being about ⅛ in. thick. The pneumatic hammer has been used successfully in place of the chisel and hand-hammer. At the Michigan mine, the cost is $3.15 per square foot, exclusive of power.

THE largest mass of native copper ever mined was found in the Minesota (spelled with one *n*) mine in the Ontonagon district, Michigan, in 1865. It weighed 420 tons, and the dimensions of it were: 46 ft. long; 18.5 ft., maximum breadth; 8.5 ft., maximum thickness. The mean width was 12.5 ft. and the mean thickness 4 feet. Twenty men labored 15 months to remove it from the rock, and the cutting of it yielded 27 tons of copper chips.

THE proper curve for the face of the cam is the involute of a circle whose radius is the distance from the centre of the cam-shaft to the centre of the stem; the lift of the cam will then be in the centre of the stamp-stem, and no pressure thrown on the guides until the toe of the cam has passed the centre line of the stem. The distance between the cam-shaft and stem is therefore fixed in the design of the cam, and if it is altered by wear of the guides, or guides of incorrect thickness, the lift will no longer be in the centre, and friction will result.

MORTARS can be sectionalized for convenience in transport, and the bottom part built of several pieces with machined faces, held together by longitudinal bolts turned to a driving-fit into reamed holes. The upper part, or housing, is made of boiler plate. A difficulty is found in securing the upper and lower parts together, since neither bolts nor rivets will stand the vibration. The only plan that has proved satisfactory is to provide a dove-tailed groove 2½ in. deep around the bottom, to drop the housing into this groove, and secure it by a caulked rust-joint.

WHERE the rainfall is abundant the ground-water roughly follows the outline of the surface, but it is less pronounced in its relief. It is nearer the surface in valleys than on mountain sides, and in a swamp it is actually at the surface. In the arid regions the ground-waters stand very deep. At Mapimi, Mexico, in the lead-silver mines they were first encountered at about 700 metres below the surface. Some observers have even questioned their necessary existence beneath excessively dry deserts. It may be, therefore, that locally they fail altogether.

THE NUMBER of drops made by stamps depends on the length of drop and on the proportions of the cam. If driven too fast the stamp will be caught again by the second arm before its fall from the first is completed—a danger that is increased by using cams with arms longer than the fall requires. A rapid drop assists discharge, by keeping the pulp in constant agitation within the mortar, and most mills are now driven from 85 to 95 drops per minute. At the higher rate the lift is limited to seven inches, and is further diminished if the speed is increased; it follows that the effect of each blow would be less, unless weight is added to the stamp. As instances of extremes of practice, mills are running at forty 15-in. drops per min., while others make from 100 to 105 drops per minute.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Correction.

The Editor:

Sir—My attention has been called to the editorial in the February 23rd issue of the MINING AND SCIENTIFIC PRESS, entitled the 'Burlesque of Mining.'

Prof. Samuel Aughey neither is, nor has been, a member of either the Smithsonian Institution or the United States Geological Survey and the *New York Commercial* is in error. The form of the report in question ought to have convinced you that this use of the Survey's authority is unwarranted and unjustly compromises this organization. Indeed, those familiar with the work of the mining geologists of the United States Geological Survey know that they do not furnish the daily press with articles of this kind. The official reports contain descriptions of mining camps which are conservative and based upon actual observation, and can not furnish "ammunition to pirates" except by deliberate misquotation. Unfortunately, there is no way to prevent editors and promoters from garbling statements from the most conservative reports. Your own quotation from 'Notes on Ore Deposits of Southwestern Nevada and Eastern California' contains a glaring error, which essentially changes the meaning of the original statement. The numerous quartz stringers are described in the Survey publication as "often cementing crushed areas" not as "containing crushed areas," as you state.

CHAS. D. WALCOTT,
Washington, March 6. Director.

[We are glad to publish this correction. The statement appeared in the *New York Commercial* of February 7. The mis-quotation to which Mr. Walcott refers in his last sentence, was not ours; we took the description verbatim from another newspaper, whose name was given. Of course, if we had supposed that the gentleman mentioned was in no way connected with the Survey, we would not have made the reference. The fact is, we supposed that he had been or was a subordinate officer of the Survey, and that he had written a letter concerning the mines or submitted to an interview, so as to become a part of the burlesque of mining. We wrote in good faith and the purpose of our remarks will be furthered by this incident, which proves that the name of the Survey and the Smithsonian is illegitimately used for the furtherance of mining schemes. In the meanwhile, we do not hesitate to apologize heartily for an unwitting propagation of error.—Editor.]

A Question.

The Editor:

Sir—In figuring out today the distance at which the centre of an electric hoist should be placed from the centre of the mine shaft, the question arose, whether the rope on leaving the drum should be parallel to the line through the centre of the drum and the centre of the driving pinion, or not. I maintained that it should be so, in order to minimize the loss of power, and also the wear on the teeth of the gearing; on the other hand, the officials of the company claimed that the position of the driving pinion in regard to the angle of the rope leaving or entering the drum, bore no relation to each other. I insisted that for best results the line of the rope must be parallel to the centre line of pinion and drum, while they claim that these equalities are not essential, and that the hoist could be 50, 75, or 100 ft. from the centre of the shaft without making any material difference, instead of an exact distance for centres with a certain height of head-frame.

I would like to have an answer published in your paper at your earliest convenience, and also leave the question open for discussion by engineers versed on this subject.

E. M. R.

Pilares de Nacozari, Sonora, Mexico, Feb. 21, 1907.

[The answer is that while the hoist is operating, the pull on the drum is constant, and it makes no difference at what point on the drum the power is applied. Therefore, there is nothing in the contention made by our correspondent. In most steam-hoists the pinion is on the rear of the hoist when looking toward the shaft. Therefore, a line drawn through the centre of the pinion-shaft and drum-shaft would be more nearly at right angles to the line of the hoisting rope.—Editor.]

The Butters Filter.

The Editor:

Sir—The discussion in regard to the Moore and Butters filter-processes has become most interesting to me and probably also to others interested in the treatment of slime. The following data may be of use to the profession; they refer to the Combination mill at Goldfield, Nevada.

The tanks and apparatus in use are as follows: Two slime-storage vats, two wash-water vats, the filter-box and canvas frames, one acid-box for the washing of frames, one vacuum-pump, one four-inch Butters centrifugal slime-pump, one two-inch Krogh centrifugal pump, valves and piping.

The pulp after agitation, containing 60% of a 1.5-lb. solution of cyanide, is discharged into the slime-storage vats (13.65 ft. diam. by 12 ft. high with slightly conical bottoms) ready for the filter-box. Two of these vats are in use, each one containing a mechanical stirring apparatus with paddles, keeping the pulp of the same consistency throughout. One vat of this capacity will easily hold three charges for the filter-box (the size of which is specified further on), and the two used in conjunction will hold about eight charges, all depending on the thickness of the pulp and cake to be formed.

The storage-vats, filter-box, wash-water vats, and vacuum-pump are all on the same level. The pump used in connection with the filter-box is placed about six feet below the vats, which simplifies the piping and operation of the valves. This four-inch centrifugal pump (patented by Mr. Butters) is especially adapted to the handling of pulp containing slime or fine sand, and has given little trouble to the operator or mechanic; it is the least troublesome pump in the mill.

The inside top measurements of the filter-box are 9 ft. 11½ in. by 10 ft. 2½ in., the sides extend 5 ft. 9½ in. above the cone, and from the discharge gate to the top is just 11 ft. 7⅛ in., with a capacity of about 785 cu. ft. when not containing the frames. The frames are 116¼ by 56¼ in., each having about 90 sq. ft. of filtering surface. There are 27 of these frames; six sets of four, and one of three. The four frames are connected at the bottom by ¾-in. rubber hose with the use of ½-in. iron nipples and Ts. Each set is connected by ¾-in. iron piping from the connection on the frames through the side of filter-box to the main (pipe on the outside) leading to the vacuum-pump. It may be mentioned here that the connecting of the frames to the vacuum pump should be at the top, in order to be convenient to get at whenever necessary.

About 35 tons of slime are treated daily at this plant, forming a ¾-in. cake on the filters with a 22-in. vacuum and washing with the same amount of vacuum for from 70 to 80 minutes with a weak solution of cyanide

(0.8 lb.), using about 10 tons of wash solution in that time.

Water is scarce in southern Nevada. If water could be used in the washing of the cakes, the time consumed would be about two-thirds that required with the use of a cyanide solution. Also if the slime could be agitated or treated in just twice as much solution as is used at present, necessitating less time of agitation and giving the same result, it would require still less time in washing the cake. The slime-treating capacity is now being enlarged for this purpose.

A record was kept of the charges, in regard to the time in forming cake, pumping of pulp in or out of box, thickness of cake, etc. The following is taken from these records when the plant was first installed:

	Minimum time. Minutes.	Maximum time. Minutes.
Filling of box with pulp	16	18
22-in. vacuum, while forming ¾-in. cake	19	22
Emptying box with 5-in vacuum on cakes	16	17
Pumping in weak-solution wash	15	18
Washing with weak solution, 15-in. vacuum	40	50
Pumping back weak solution	15	16
Filling with wash-water	15	16
Washing with wash-water, 22-in. vacuum	30	50
Sampling cake	7	10
Dropping cake with water	12	14
Running back surplus water	8	10
Sluicing	5	7
Total	198	246

Five months later when carbonate of lime became noticeable and with increased amount of slime in the pulp, the figures were:

	Minimum time. Minutes.	Maximum time. Minutes.
Filling	18	20
Vacuum	22	25
Emptying with 3-in. vacuum on cake	17	20
Pumping in wash	16	18
Washing with 22-in. vaccum	70	80
Sampling cake	7	10
Dropping cake	14	15
Running back water	8	10
Sluicing	5	7
Total	177	205

You will notice that two washes were used when the plant was first installed, but later only one. The reason for this change was the increased amount of slime; the saving of time; the exposure of the cakes the second time for so long to the air, causing them to crack; the wash-water often contained as much cyanide as did the weak wash and the second process gave better results.

At first, when the canvas was new, while pumping the surplus pulp out or wash-water into the box after the cakes had been formed, a vacuum of 5 in. was left on the frames, this being just enough to keep the cakes from slipping off and not enough to dry or cause cracking, but I found as the carbonate of lime began to form on the canvas (and where only the dipping of the frames in hydrochloric acid was resorted to) that five inches was too much vacuum and caused the cakes to dry and crack, but three inches proved more satisfactory.

After the washing of the cakes they are dislodged from the frames by water forced from the inside. The surplus wash-water is run back to the storage-vat by gravity and only that water (4½ to 5½ tons, depending on the amount of associated washed slime) remainng in the cone of the box is lost, which is necessary in sluicing the slime away through an 8-in. quick-opening gate-valve.

Very little has been said heretofore about the carbonate of lime forming on and in the filters, which in my opinion is quite an essential obstacle to be got rid of. Although somewhat simple, it is a necessary feature in the successful operation of the process, and it cannot be accomplished by simply dipping the frames in a 2% solution of HCl and water where any large amount of lime is used in the milling of the ore, say from 7 to 20 lb. per ton. It must be accomplished by washing with the use of vacuum, or any other means that either forces or draws the dissolving 2% solution of HCl acid through each cell of the cocoa matting for 15 to 45 minutes. If this process is used, the frames will only have to be subjected to the wash once in three or four months, depending on the amount of lime in use, whereas the dipping operation would have to be done at least once in two or three weeks and then it would be very unsatisfactory.

Although a small formation of lime on the filters does not seem either to interfere with the washing of the values from the cake or to diminish the net extraction, it greatly prolongs the operation and reduces the capacity of the plant.

One cubic foot of dry Combination slime weighs 76 lb. or thereabout, while 160 lb. in water only occupies one cubic foot. It was found that one square foot from a ¾-in. cake contained 5.03 lb. dry slime and 28% moisture, so, calculating from these results, in forming a ¾-in. cake you would be treating 6.11 tons of dry slime per charge. But from a larger test we found that 6.76 tons were treated in forming a ¾-in cake, due to the greater thickness of the cake at the bottom of the frame.

Now, I think I shall be stating the truth when I say that a plant of this size and design, when filters are kept free from $CaCO_3$, by washing for 70 minutes you can treat 50 tons of slime (having the same characteristics as that produced in the Combination mill) in every 24 hours, counting all delays, with the use of a 15-h.p. induction motor operating two mechanical agitators, one vacuum pump, one 4-in. centrifugal slime-pump, and three 2-in. centrifugal pumps.

One man per shift of eight hours can easily operate the valves from a platform near the filter-box, and have plenty of time for other mill-work.

The Butters-Cassel process for filtering slime is certainly a great improvement over all other processes and as an invention it ranks with the tube-mill in importance.

E. S. PETTIS.

Denver, February 28.

Penn-Wyoming Copper Company.

The Editor:

Sir—In your issue of March 9 I noticed that your London correspondent refers to the Penn-Wyoming Copper Co., giving some figures that would indicate that the company is on the verge of a long and prosperous period of production. While but little reliable information concerning the venture is at hand, especially in regard to the financial side, in regard to which the company has always been decidedly reticent, still, I believe the prevailing impression among engineers is that the property is not as good as the reports sent out by the company would seem to indicate, and it may be well to sound a note of warning to British investors.

While some of the properties included in the consolidation have produced rich ore, I believe it is considered that many of these are worked out. The 16-mile tramway has always been an expensive affair and has caused much trouble. The mining, transportation, and treatment costs have always been high, and low-grade ores will not pay under existing conditions. The equipment is small and badly arranged. The smelter only contained three small converter-stands, and the furnace capacity was only 350 tons per day. The water-power has never proved adequate.

It is well known that the methods of financing this company were not the best. Agents of the company made a town-to-town canvass, appointing sub-agents in each place to sell stock. The result has been that a good

deal of stock has been placed with small investors, such as clerks and small merchants, who know nothing of the mining business, and are proverbially 'easy' in a matter of this kind. Each of these agents and sub-agents has received a liberal commission on the sale of stock, which commission, of course, has been paid by the purchasers, who are often induced to invest a sum that represents the savings of a life's work. I believe that in this country we are inclined to be suspicious of any mining enterprise that is financed in this manner. The capitalization is $10,000,000, and the stock has been sold to the public at prices ranging around 50 cents per share.

As for the London correspondent's letter, he speaks of the net profit for the last 90 days' run, just previous to the shut-down. How about the profits for a longer and more representative run? How about the net profits during 1905, when the company produced about 2,385,000 lb. copper at an estimated cost of 7c. per lb., when the figures would seem to show that the cost was 14c. per lb., just twice that estimated by the company. It is doubtful if any profit whatever was made in 1905. The old North American Copper Co., which was succeeded by the Penn-Wyoming, was over-capitalized and badly managed, and failed dismally, its assets being sold at public auction for much less than the debts of the company, making the stock worthless, and leaving the shareholders wiser, but poorer. The Penn-Wyoming Co. advertises to be paying monthly dividends at the rate of 6% per annum, and at the same time is selling stock at 50c. per share. What is the public to think of a concern that is paying unearned dividends, and at the same time making a strenuous effort to sell stock to wage-earners and small-salaried people?

T. S.

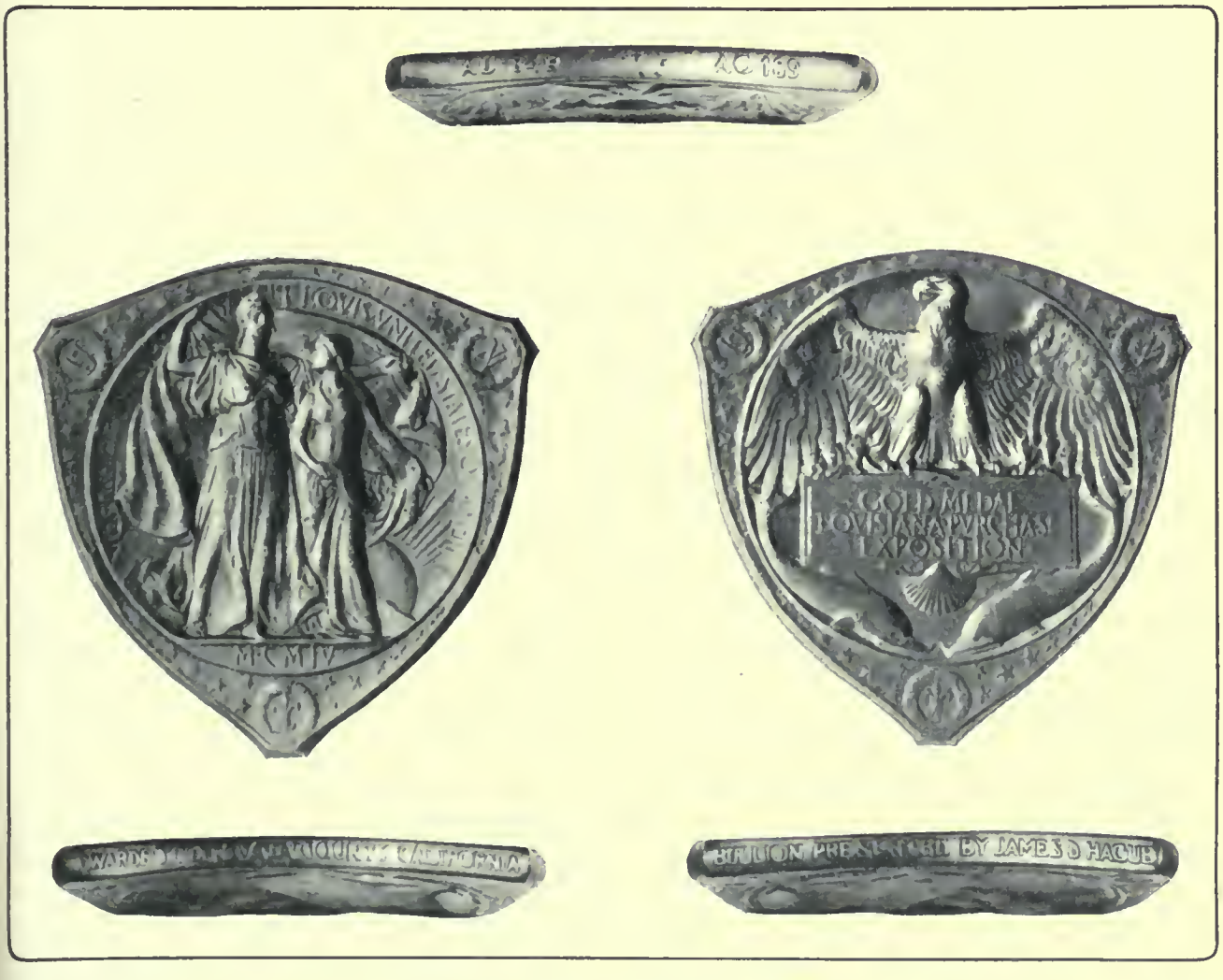
San Francisco, March 9.

A Handsome Medal.

The Editor:

Sir—Thinking that you may like to make some use of it in your paper, I send you herewith a photograph, which I have recently caused to be made at Tiffany's, showing five different views of the gold medal that was awarded for the mining exhibit of Nevada county, California, at the Louisiana Purchase Exposition at St. Louis in 1904.

At the time of the Exhibition I said to the Nevada County Commissioner that, if the exhibit received the hoped-for award, I should be pleased to supply the gold for the making of the medal in the form of fine bullion,



as usually produced from one of Nevada county's oldest mines, the North Star; and it is in fulfillment of that offer, after unavoidably long delays, that the medal, which was struck last year at the United States Mint, in Philadelphia, and recently finished at Tiffany's by the desired chasing and lettering on the rim, has just now been sent to its final destination in California.

The bullion is 849 fine in gold and 139 in silver; and the weight of the medal is nine ounces.

JAMES D. HAGUE.

New York, March 5.

SOME great electrical engineering projects have been submitted to the New Zealand Government by its engineer-in-chief, in the course of a report on the utilization of New Zealand's abundant water-power. One of the most notable schemes aims at tapping the Huka falls, and supplying the Auckland district with 76,000 h.p., the estimated cost of the necessary plant and works being $8,000,000.

How the Miner's Dynamite Is Made.—II.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

The nitric acid used in the dynamite works is made from Chile saltpetre (sodium nitrate), which occurs as a saline crust, or in strata, on the deserts of Chile. It is purified by crystallization, sacked, and brought in steamer loads to San Francisco. Besides being used in making the nitric acid, it is also used as a principal constituent of the 'dope,' with which the nitro-glycerine is mixed to form dynamite. As it arrives it contains about two per cent moisture, and, since a powder-maker loves moisture in his materials about as much as a dog loves fleas, the first step is thoroughly to dry it. This was formerly done by melting it in large iron kettles and allowing it to flow into an agitating trough, in which it was granulated while cooling. But the latest drying machines used for the nitre are the long cylindrical rotary dryers, now in common use throughout the country. The nitre is dried by a stream of hot air, without fusion, and with considerable economy in fuel over the old method. The nitre which is to be used for the 'dope' is ground after drying.

The nitric acid is made by gently heating the dried sodium nitrate with strong sulphuric acid in large iron kettles and collecting the nitric acid, which distills off, in condensers. Formerly a series of 50-gal. stoneware Woulff jars were used, but now rows of horizontal glass tubes 1¼ in. diam., and cooled by trickling water, are employed. This is known as the Hart system, and it is used at the California Powder Works and at the Vigorit. A charge for a nitric acid kettle consists of 1,100 lb. dried nitrate and 1,125 lb. sulphuric acid, as strong as possible. From this 690 to 700 lb. nitric acid is obtained if care is exercised in the regulation of the fire. The nitric acid obtained has a strength of about 94% (48° B.). If the heat is raised too high some of the nitric acid is decomposed into nitrogen tetroxide, oxygen, and water. The water is distilled over with the nitric acid and dilutes it, so that it sometimes happens that the last condensations, which come over when the heat is greatest, have to be rejected. Decomposition of the nitric acid also forms nitrous acid which interferes with the yield. Much nitrous acid in the mixture is also supposed to be a source of danger.

The nitric acid thus prepared is mixed with strong sulphuric acid in the proportion of about 3 lb. nitric to 5 lb. sulphuric. The two acids have a strong affinity for each other and the mixing generates considerable heat, so the mixed acids are allowed to cool before being used in nitrating the glycerine. Since the introduction of the contact process, a fuming sulphuric acid is being used with just enough sulphur trioxide to unite with the 4% of water in the nitric acid, the mixed acids being thus 100% in strength. Fuming sulphuric acid has not yet been used during the operation of nitration.

All the dynamite works in California take advantage of the elevations afforded them by the Contra Costa hills and place the buildings in which the glycerine is nitrated above the other buildings. Thus the nitroglycerine can flow by gravity from the nitrators to the separators, thence through lead-lined troughs around the hill to the storage tanks, and thence to the mixing house, where it is incorporated with the 'dope.' The buildings, where not sufficiently protected by the curves of the hill, have wooden bulkheads, filled with earth, thrown up between them. Since the nitrating house has the highest situation at the works, the mixed acids have to be pumped up there. This is done by running them into a cylinder of boiler iron (called a 'montejus'), closing the inlet cock, and turning on compressed air till the content has been forced through a pipe-line to the iron storage-tanks on top of the hill.

The glycerine used by the powder works is of a special brand called 'dynamite' glycerine, made to contain the minimum quantity of water. It is of a very pale straw-yellow color, and comes to the powder-works in tank-cars or in iron drums from manufacturers in the East. Some of the crude is now also being made in San Francisco. Some years ago there was considerable difficulty in obtaining glycerine that was strong enough, and the California Powder Works put up a plant for refining their own glycerine. Since then the manufacturers have been furnishing a glycerine, practically free from water, that gives good satisfaction. The wholesale price of glycerine varies from 13 to 16c. per lb., and, in making nitro-glycerine, it is about equally expensive with the nitric acid, of which three times as much is used.

The amount of glycerine that is nitrated in one charge differs at the different works. The Giant works use 620 lb., the California works 900 lb., and the Vigorit and Judson each 600 lb. For a 600-lb. charge, 4,500 lb. of mixed acid is weighed out in a tank-scales and run into the nitrating vessel, or 'converter.' Then the glycerine is weighed out on a small tank-scales and is slowly run into the nitrator in a thin stream. The works that have best developed their systems for recovering the waste acid use a little higher proportion of mixed acids, because it increases the yield within the limits of the recovery expense; the above 4,500 lb. might thus be increased 4,800, or even 5,000 lb. The nitrator is made of boiler-plate, and is about 4½ ft. diam., and of the same depth. The bottom slopes so that it can be thoroughly drained. The nitration of the glycerine generates a large amount of heat, therefore the nitrator is provided with iron coils through which cold brine is kept running. A double paddle dips down into the mixture, and if the temperature rises too high the workman who is mixing the charge shuts off the stream of glycerine for a few minutes, until the cooling coils have brought the temperature down again. At the Vigorit we used to mix at 82° F., using salt water from the bay in our coils. With refrigerating houses to chill the brine, such as are now in use at all the works, the temperature is kept down to 45 or 50° F. At one time the Giant used to mix at 95°, but most men think that is leaving too narrow a margin for emergencies, let alone the debatable question as to the yield that is obtained at that temperature. The brine is generally cooled by the ammonia absorption system, running on the exhaust steam from the power-house.

Below the nitrator is a large tank of water holding upward of twenty times the volume of the former. If a charge gets beyond control it will generally take fire before it explodes, and if this happens the attending workman opens a large cock and allows the burning charge to be 'drowned' in the large volume of cold water below. The nitrator is also fitted with a jet of compressed air for agitating and cooling the charge in case af emergency.

During nitration a small amount of reddish fume of nitrogen trioxide and tetroxide is given off, and these are carried by an air jet up a small stoneware chimney. The latter has a glass in it so that the workman can see the amount of fume that is given off, as the quantity increases largely when the charge begins to heat up. Our nitro-glycerine foreman at the Vigorit used to claim that he could mix his charge perfectly by watching the fume that was given off, without use of a thermometer; but we never tried to economize on thermometers. With the refrigerating system now in use, and the corresponding low temperature of nitration, almost no fume is evolved.

With a good supply of cold brine a charge can be run in half an hour, but a few years ago when we used to use the water from the bay in our coils, it sometimes took as long as an hour and a half.

When the mixture is finished, the charge is allowed to stand in the nitrator for a few minutes in order to be made as cold as possible. It is then run into a 'separator,' which is a square box made of sheet lead, 5 by 5 ft., and 2½ ft. deep, with a sloping bottom. It is provided with a funnel which can be raised or lowered, so that the liquid can be drained out to any desired level. When the charge comes into the separator it is homogeneous, the nitro-glycerine existing as tiny globules diffused throughout the mass of the acids. In 20 to 40 minutes these globules have risen and formed a layer resting on the acids, the reason being that nitro-glycerine has a specific gravity of 1.6, while that of the mixed acids (after nitration) is 1.7. While the mixture is standing in the separator a workman takes note of its temperature, because the acids are generally still more or less active in nitrating a little more of the glycerine, which, of course, gives rise to heat, and which might easily make the charge take fire. There is a glass in the separator, and when the workman sees that the separation is complete he gradually lowers the funnel untill all of the nitro-glycerine has been skimmed off the acids. It runs from the funnel into a washing tank, 4½ ft. diam. and 7 ft. deep, made of redwood treated with paraffin oil. In the washer it is churned with lukewarm water (which has a little sal soda in it) by means of a spray of compressed air introduced at the bottom of the tank. When the air is turned off, the nitro-glycerine, which is heavier than water, quickly settles to the bottom, and the water is drawn off the top through a cock in the side of the washer.

The washing is important, because nitro-glycerine that has been thoroughly washed is a stable compound; on the other hand, if it has any acidity, decomposition will gradually set in, and in time it will spontaneously explode. At the Vigorit works we used to wash five times, three times with the weak soda solution and twice with water. Water from the bay is used. The workmen test the water with litmus paper, and when the wash-water shows no acidity the washing is stopped. The nitro-glycerine is then run into a weighing tank, and the amount obtained from the charge of glycerine is noted for the benefit of the superintendent. The wash-water runs off through some long skimming-troughs, from which a little nitro-glycerine is taken and added to the other in the weighing tank at the end of the day.

The separators have no cooling coils in them, but there is a jet of compressed air to cool them in emergency. If a charge takes fire the workman runs it into a drowning-tank. Our nitrating and separating houses used to be a little distance apart, a condition which is compulsory in Europe. One day a charge in the separator took fire, and the workman in charge got 'rattled' and ran. The foreman in the nitrating-house, not having his whistle signal answered, went to investigate, and found the charge on fire. At first he too ran, but after getting a couple of hundred feet away he changed his mind, went back to the burning charge, turned the drowning-valve, and ran it out into the bay, where it exploded without damaging the works. After that I followed the good example of the Judson works and consolidated the nitrating and separating machinery in one building. Such an arrangement places more eggs in one basket, but it enables the foreman to keep his eye on all the eggs.

A few years ago the yield of nitro-glycerine from each 100 lb. of glycerine charged used to be about 200. It would vary from charge to charge, from as low as 190 up to 210 lb. The different works were making averages between 200 and 205. Then, side by side with the struggle to increase the strength of the acids, attempts were also made to increase the completeness of the separation; for, of course, there was no wisdom in making so precious an article as nitro-glycerine and then letting it run away in the waste. It was generally known that the colder the charge when it entered the separator, the quicker and larger was the separation. The California Powder works began the practice of putting ice in the tank that supplied the cooling water. Then Mr. Frank Roller, superintendent of the Giant Powder works, erected an elaborate refrigerating house, in which to chill the waste acids and obtain a second skimming of nitro-glycerine. This method he finally abandoned in favor of the simpler one of chilling the charge thoroughly in the nitrator before sending it to the separator, and that is the system in general use today. The refrigerating system has increased the yield not less than 5 points, or 2½ per cent.

When the Peyton Chemical Co. commenced shipping mixed acids three years ago, it was found that their contact-process acid raised the yield from 200 or 205 to 218 and 220 lb., an increase of 8 or 9%. Since that time so much attention has been bestowed upon the second boiling of the sulphuric acid that its average strenth has been brought from 95 up to 97 or 98%, and the yield from a combination of the best chamber-process acid and the freezing system is now between 218 and 220. When the contact acid plant at Hercules is completed the yield at all the works will be better than 225, and before another year has gone by persistent effort will have raised it to 230, out of a possible 246 pounds.

When the powder 'trust' was formed three years ago there was some apprehension among the mine owners that the price of dynamite might be advanced. The above increase in yield shows that the 'trust' managers did not need to take any such unpopular step; for by "attending to business" and improving their processes, they have, in the nitro-glycerine branch of their business alone, made savings that mean as great a profit as if they had increased the price of 40% dynamite from 10 to 10½c per pound.

The use of sulphuric acid from the contact process greatly improves the separation, because such acid is perfectly clear. The intense boiling of sulphuric acid from the chamber process contaminates it with lead and iron sulphates, carbon, and silica from the pans. Such acid is always cloudy, and cannot be sufficiently purified by settling. The fine particles seem to interfere with the rising of the nitro-glycerine in the separator. At one time I experimented in separating out this foreign material by running the acid through a centrifugal machine, but after the advent of the contact process such a step became unnecessary. The contact acid is also free from arsenic and lead, and contains less iron, all of which interfere with the nitration.

After the nitro-glycerine has been skimmed from the acids in the separator, the 'waste' acids, as they are called (because once upon a time they were wasted), are run off through a pipe and are recovered. Now let us figure up what we put into a nitrator and what we get out in the form of nitro-glycerine, and then we shall see about what is left in the 'waste' acids.

Our charge consists of, say, 600 lb. glycerine, 1,687 lb. nitric acid (94% strong), and 2,813 lb. sulphuric acid (96%). The acid contains 1,586 lb. pure nitric, and 2,700 lb. pure sulphuric, and the other 214 lb. is water. If the glycerine is completely nitrated it will have taken up 1,233 lb. pure nitric acid, with formation of 346 lb. water. Our waste acids will thus contain all of the sulphuric

acid, 353 lb. pure nitric, and the water that was originally in the mixed acids plus the water formed during nitration, totaling 560 lb. Their composition will thus be 74¾% sulphuric acid, 9¾% nitric acid, and 15½% water (not allowing for the little nitric acid that escaped as red fume during nitration). Since we never get a complete nitration in practice, the nitric acid will be slightly greater and the water slightly less than the figures given. If we obtain a yield of 220 (or 1,320 lb. nitro-glycerine) instead of the theoretical 246.9, then there is 65 lb. glycerine that

Sorting Ore at Palmilla Mine.

we did not obtain in the form of nitro-glycerine and that is yet to be accounted for. Some of this partly nitrated glycerine was carried over with the nitro-glycerine in the separation and dissolved in the wash-water—because the di-nitrate is quite soluble in water, whereas the tri-nitrate (nitro-glycerine) is very nearly insoluble. But most of the glycerine is still diffused in the acids, as a di-nitrate, for the latter does not rise in the separator as easily as the nitro-glycerine, and is thus left behind. If we could make a perfectly clean separation of the various nitrates of glycerine, the problem of recovering the waste acids would be greatly simplified because the glycerine products, if left in contact with the acids, will in two or three days spontaneously explode. At one time I made experiments in separating the glycerine products in a centrifugal machine (just as cream is nowadays skimmed from milk) and the separation was so clean that the waste acids stood safely for three years; but so far as I know, such machinery has never been used in manufacture.

The method employed at all the plants is to run the waste acids through what is called a 'de-nitrator.' This is a chamber lined with acid-proof brick into which a jet of steam is blown. By diluting the acids and heating them, the nitric acid is decomposed and driven off as the red fumes of nitrogen trioxide and tetroxide, mixed with oxygen. At the same time the nitro-glycerine globules floating on the surface (which escaped the separator or have been formed since) are vaporized and burned up.

The oxides of nitrogen are carried into condensing towers filled with coke, quartz, or stoneware balls, to expose a large surface to the water that is kept trickling down. Hot air is blown into the tower and the red fumes are thus converted back into nitric acid again. Seventy per cent or more of the nitric acid contents is thus recovered as a weak nitric acid of 40 to 50% strength (35 to 40° B). As there is no demand for nitric acid of this strength in the vicinity of San Francisco, and as nitric acid cannot be concentrated in any simple apparatus above 68% (because the water then distills over with the acid) this valuable material was all formerly wasted; but now it is being carefully saved and made by the powder works themselves into ammonium nitrate and other products.

The sulphuric acid that comes from the de-nitrator after separation of the nitric acid has a strength of 63 to 70% (50 to 55° B). It is then boiled in the sulphuric acid recovery, first in lead and then in iron pans, as described for the concentration of chamber sulphuric acid. The heat carbonizes and thus destroys what remains in the acid of the glycerine products, and the last of the glycerine is thus entirely eliminated. A few years ago only about 80% of the sulphuric acid was recovered. But the fumes from the last pans, which consists of about half water and half acid, are now more effectually condensed by means of condensation towers. Up to 95% of the sulphuric acid is now recovered. This is as good a result as is achieved by chamber sulphuric acid works, which only concentrates to 93½ per cent.

Ore-Sorting House at Alvarado's Mine.

(TO BE CONTINUED.)

KAMES are mounds of water-laid drift, sand, or gravel, rather poorly stratified, and built at the ice margin of a glacier, by glacial drainage. They are a form of morainal drift.

The Parral District, Mexico.

Written for the MINING AND SCIENTIFIC PRESS
By F. LYNWOOD GARRISON.

This famous silver mining district, in the State of Chihuahua, was once one of the most productive in Mexico, and though long decadent it now bids fair to resume its wonted prosperity by virtue of American capital and energy. A recent brief visit enabled the writer to gather a few notes and observations that may be of interest.

The general geological conditions of the Parral district

Santa Cruz Hill, Parral.

are those of the western Sierra Madre, or rather the eastern flank of the western branch of this great mountain system. The rocks are essentially made up of folded, faulted, and uplifted Cretaceous limestone, accompanied by vast Tertiary igneous deposits. This limestone has been positively identified as Cretaceous and is not Paleozoic, as was once supposed, though lithologically it resembles the mountain limestones of the Appalachians. This limestone is not exposed in the immediate vicinity of the town, but it appears at the Jibosa copper mine, near Jiminez, a few miles east of Parral. In and about Parral there is an association of folded slates associated with, and cut by, igneous fissure-flows and dikes of both acidic and basic character. Most of the eruptive material is rhyolite and dacite with their breccias or agglomerates and tuffs, the latter usually indurated. The rhyolite flows are supposed to be later than the ore deposits and the orebodies occur in andesite covered by the rhyolite, except where erosion has uncovered it. My friend, Mr. F. J. Keeley, of Philadelphia, has kindly made microscopical sections of some of the Parral ore-bearing rocks, and we found their structure to be rhyolitic and not andesitic, since there appears to be in them an absence of triclinic feldspar, which is one of the essential characteristics of an andesite. Further studies of these rocks may perhaps show some to be andesitic, rather than rhyolitic, but it would appear to be an error to assume, as has been frequently done, that the silver ores of Parral are in andesitic rocks to the exclusion of others. It goes without saying that the only safe and proper way to settle questions of this kind is with the microscope; in fact, the practical value of this instrument to a working mining engineer should be more generally recognized than it is. Whether the gray shale and slate associated with the eruptive rocks are altered sediment or metamorphosed (schistose) eruptive has apparently not yet been ascertained and perhaps never can be; further petrographic examinations may show them grading into eruptives and one eruptive shading into another.

One of the most evident characteristics of the Parral ores is their highly silicious character, the ore-bearing rock having usually a micro-felsitic structure of a greenish-gray tinge Alteration products, such as chlorite and epidote, are common in the veins and on their walls. Some of the deposits contain an abundance of zinc-blende and galena, but the characteristic Parral silver ore is a dense, silicious rock, carrying the silver in a sulphide form generally associated with much pyrite, and in the upper levels of the mine with alteration products, such as silver chloride and iron oxide. The silver ores are commercially called 'dry,' and in the older metallurgical practice they demanded an admixture of lead ore to insure proper smelting.

The existence of zinc in the silver-lead ores of the district appears to have been a decided detriment in the

On the River, at Parral.

past, owing to its objectionable characteristics in the old smelting practice, and until modern methods of treatment could make such zinc minerals commercially valuable they were neglected or thrown away.

The vein zones of the Parral district are pretty well defined, the majority of them having a general north and south trend. It must not be supposed that they are all, or even most of them, sufficiently rich to be productive throughout their length; the good ore is undoubtedly localized in spots and over restricted areas, but the

orebodies appear to be numerous, rendering the general prospect for the camp most promising.

Mining work was first begun in Parral during the year 1632, and at Santa Barbara, fifteen miles to the southwest, as early as 1556. At both places the gold ore appears to have attracted the attention of the Spaniards, and was taken out in large quantity from rich pockets near the surface. The proportion of gold, however, seems to have decreased rapidly with depth, and the pockets were soon exhausted. Copper is found in several places near Parral, but in the early days it attracted no attention, being valued only for the purpose of making *magistral** for use in the *patio* process.

Some new copper prospects are now being developed that must be considered encouraging; they are chiefly composed of chalcopyrite and bornite underlying the silver-lead-zinc ores in certain localities. At any rate these copper sulphides appear to come in with depth and usually do not give any indication of their presence at the surface. Whether they exist in quantity sufficient to be of commercial importance remains to be determined.

The Santa Barbara ores are said to carry much more lead than those of Parral, and in former days they were largely used as 'softeners' for the more silicious Parral ores. The galena and zinc-blende seem to increase with depth in the Santa Barbara veins, and are accompanied by some silver sulphide.

In the early days both Parral and Santa Barbara had their 'chloriders' (*buscones*), those human gophers who dig and delve out the richer superficial portions of orebodies to their permanent detriment or everlasting ruin. This class of miners is not peculiar to Mexico, but is familiar to everyone acquainted with the silver-lead districts in the desert areas of Nevada, Arizona, and California.

Probably few, if any, of the old Parral mines reached a great depth, their history being similar to that of most old Mexican camps in that their operation was suspended by inability to handle the inflow of water when a considerable depth was attained, although at Parral and Santa Barbara the ore thus abandoned is said to have been enormously rich—800 to 900 oz. silver per ton. The older operations at Parral appear to have been centred about Santa Cruz hill (Fig. 1), which was once assumed to contain the Mother Lode or *Veta Madre*—a favorite expression with the Mexican miners! This lode or orebody is on the southern slope of the hill and trends east and west; it carries the Ronquilla, Apodaquena, Tajo, Prieta, and other shafts. On the northern side of Santa Cruz hill there is a lode running east and west, containing the Tecolote, Jesus Maria, and Aquilarena shafts. Both of these lodes are said to have been rich and profitable, but the old shafts and workings were badly placed. The average assay of the ore from this hill probably ranges between 30 and 50 oz. silver per ton, with occasional bunches of higher grade. Much good ore is said to have been left in the old workings, soon to be recovered by the new American companies coming into the district.

The most notable mine in the Parral district is the Palmilla, owned by Pedro Alvarado, a Mexican made famous by American newspapers. Both the richness of this mine and the eccentricities of its owner have been greatly exaggerated by the scribes, Senor Alvarado being neither a fool nor a Midas, however much his policy in operating this mine is open to criticism. The Palmilla property is a couple of miles west of the town of Parral, and has been opened by shafts in the top of a high hill on whose crest a number of veins outcrop. The ore is a silicious material carrying large quantities of silver sulphide, together with sporadic bunches of galena and zinc-blende. The prevailing local opinion seems to be that this mine is located upon a great east-west ore-bearing lode or zone, and numerous attempts are being made to find other rich deposits or spots upon it. One can stand on the top of Palmilla hill and follow with the eye a long line of head-frames running for miles to the east and west over hill and gulch. My stay in Parral was altogether too brief to permit careful observations, much less a study, of this most interesting, and in a way, fascinating operation; tens of thousands of dollars are being spent to find another Palmilla—let us hope, not in vain!

There are a large number of shafts on the Palmilla property, one or two being at least 500 ft. deep. The water-level appears to be between 500 and 600 ft., and the ore at this level is said to be very rich and in great quantity; the high-grade ore, I was told, ran as much as 7½ kilo. (234 oz.) silver and 79 gm. (2.528 oz.) gold per ton. The low stuff averages 1½ kilo. (46.8 oz.) silver and 2 to 10 gm. (0.064 to 0.320 oz.) gold per ton. The crude ore raised from the shafts is hand-sorted in a primitive manner, the richer being sacked and shipped to certain smelters and the lean thrown on the dump. Recently, I understand, the low-grade material on the dump has been sold to an American company, which proposes to treat it by cyanidation. The Palmilla orebodies are among the very few in the district that carry any considerable quantity of gold. As far as explored, no copper ore has been encountered here.

A notable feature of the Palmilla mine is the enormous cross-vein of calcite, which appears to cut across the orebodies; in the side of the road leading up to the mine this vein is about a hundred feet wide, and I was told it can be traced to the north and south several miles from this point. It is practically barren of valuable metals. I was told there was no faulting in the Palmilla orebodies, but this is open to doubt. Although the Palmilla or another property of the same name was worked in the early days of this camp, its value was not realized until recently.

Magistral is an impure mixture of cupric and ferric salts, produced by roasting copper and iron sulphides, and was used in the *patio* when sulphate of copper ($CuSO_4$) or blue vitriol was not available.

ARTIFICIAL GRAPHITE.—This industry, like that of carborundum, owes its development on a large scale to the inventive genius of E. G. Acheson. The process consists in the electrothermic transformation of amorphous carbon into graphite. The carbon in the form of bars and rods, produced by a similar method to that employed for making carbon electrodes for arc lamps, is heated to a high temperature in a resistance furnace, very similar in type to that employed in the manufacture of carborundum, and during this heating is completely transformed into graphite. The product has been employed chiefly in the electrical industry, but recently the process has been extended, and the graphitization of lumps of anthracite coal and coke is now carried out. The resulting material is displacing natural graphite in many of its varied uses. In 1904 some 1,450 tons (metric) of artificial graphite were produced, 1,000 h.p. being continuously employed. The plant has now been duplicated owing to the increasing demand.

THE Yukon-Tanana region, which has recently been investigated by representatives of the U. S. Geological Survey, includes that part of the interior of Alaska delimited by the Yukon and Tanana rivers and the international boundary. It is 300 miles west from the boundary to the junction of the two rivers, and the greatest distance in a north-south direction between them is 175 miles. The area is about 40,000 square miles, or more than half that of the State of Washington.

Notes on the Copper Range.

Written for the MINING AND SCIENTIFIC PRESS
By AN OCCASIONAL CONTRIBUTOR.

The Trimountain shafts, in the copper region of Lake Superior, are placed 1,000 ft. apart along the strike, with double-track standard-gauge railroad running beneath them for taking the ore to the mill. At certain points the track is laid at a grade that will allow the empties to be easily run down under the bins by a man, without motive power. The railroad car used takes 41 tons of broken ore when full, and is the recognized measure of the quantity stamped. Over the shafts are combined shaft and rock-houses, usually made of wood and steel, respectively.

Fig. 1. Trimountain No. 2 Shaft.

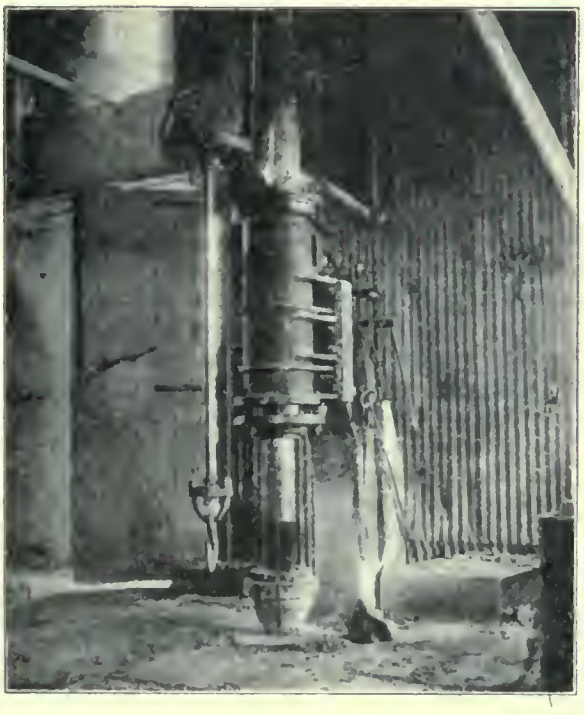


Fig. 3. Air-Lift and Hammer.

In height they are seen up to 100 ft., with their sheave-axles as much as 85 ft. from the ground.

The skips hoist 2.5 tons on an average, and are of the self-dumping type. As the skip approaches the surface the signal-man, in his box near the sheaves, rings a warning electric bell for the rock-men, when the ore is shot onto the plates above the grizzly. To break the velocity of the heavy pieces, a wooden buffer, made of three 8 by 8-in. blocks, armored with 3-in. rails on the upper side, is suspended by chains just above the level of the grizzly. The grizzly itself is 10 ft. 6 in. long, slopes at about 37°, and is made of 3 by 12-in. plank with a strip of manganese steel 1 in. thick and 4 in. wide, screwed onto the top. An alternative construction is to use an inverted 50-lb. rail on which the same 4-in. strip of manganese steel is riveted. The width between the bars is three inches. These forms of grizzly answer admirably and are practically indestructible. The old type of a single round bar is apt to break, and is continually distorted, giving an irregularly sized product. (See right-hand grizzly in Fig. 2).

About eight feet from the foot of the grizzly are two

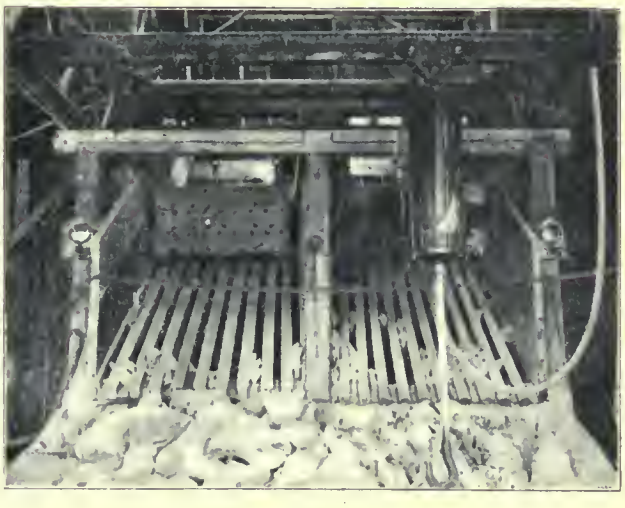


Fig. 2. Grizzly at Trimountain No. 4 Shaft.

12 by 24-in. Blake crushers with the tops of their jaws at the level of the ground. A space in between them allows of a temporary accumulation of copper ore, for when the skips are being dumped at a good rate the 'rock-men' are the hardest worked people in the district. Oddly enough they are also the most poorly paid.

One of the Champion shafts use a Gates (No. 7½) crusher, beside the Blake machines. It is convenient, in that it crushes faster, but it is more troublesome when

Fig. 4. Mass Copper at Champion Mine.

'mass' (chunks of native copper) gets into it than the Blake. Ordinary mass is picked out by hand, and thrown aside. When a piece is too heavy to move, or is too big for the crushers, it is attached by a chain to the hook of the 'air-lift' (seen in foreground of Fig. 2), raised from the ground, and taken some 20 ft. to the drop hammer (or air-hammer). The air-lift has a 10-in. cylinder and has air at 60 lb., so will carry about two and a half tons. The air-hammer (Fig. 3) will then break up the piece sufficiently to allow of its entry to the crushers. As these have only a stroke of 2 ft. 8 in. as

maximum, and as the efficiency of the blow diminishes with the size of the rock under them, they have been gradually replaced by drop hammers, like those used for pile-driving, and worked by the same kind of engine. The hammers weigh 2,800 lb. and can be raised a clear height of 20 ft. if necessary. Such a blow will crush anything, and rapidly cleans copper from its surrounding gangue. The shoes on the drop hammers are of the same shape as that shown on the air-hammer, and are made of manganese steel. They last indefinitely, whereas those made of cast iron were broken within a week.

The cleaned mass does not go to the bins, but is shot out from the rock-house to the ground below, whence it is taken monthly on flat cars straight to the smelter. The monthly 'rodeo' at Trimountain, shown in Fig. 4, netted about 50 tons, the largest pieces weighing 1,600 to 1,800 pounds.

Mining in Depth at Cripple Creek.

In the last annual report of the Portland Gold Mining Co., the consulting engineer (Victor G. Hills) says:

The report of the United States Geological Survey on the geology and gold deposits of the Cripple Creek district has just been issued. It confirms what most Cripple Creek mine operators have expected for many years; that a very considerable portion of the rich ore-shoots of the district do not extend to 1,000 feet in depth. The time has long since passed, if there ever was a time, when there was any use of trying to blind ourselves to this plain fact. This general condition applies to the Portland mine, for the fact is that there appears to be a considerable less number of ore-shoots below the 1,000-ft. level than above. Yet the whole truth in regard to the condition at this mine is *not* discouraging, and as compared to a majority of the mines of the district is rather flattering. Some of the earlier ore-shoots have pinched with depth, while others were only discovered at considerable depths and did not extend to the surface, and some continue to the greatest depths yet reached, and have even increased in size or grade for the last 100 ft. The condition regarding the ore deposits with depth, is concisely stated thus: The 900-ft. level was the poorest yet opened. The 1,000-ft. level was much more productive than the 900. The 1,100-ft. level is proving poorer than the 1,000-ft. level, although some of the important veins have not yet been cut. During the past year work was started to develop the 1,200-ft. level. Three winzes were started at points far distant from each other and on different veins. On the No. 1 vein the winze was sunk to a depth of 150 ft. to water-level, all in good ore, and drifts were started at the bottom with the purpose of making this the next general level of the mine, and thus save some expenditures in shaft stations and long cross-cuts. Drifts were run on this vein 27 ft., all in ore, when rising water decided the abandonment of this level, and drifts were started at an even 100 ft. below the 1,100-ft. level. This drift is now 114 ft. long and still in ore, and it is not known whether the shoot will be longer or shorter than on the level above. The grade of the ore is decidedly better than on the 1,100-ft. level.

THE Chicago tunnel system for handling freight, mails, etc., will probably soon be doing a large freight business, as it is reported that contracts have been made with 26 railways for handling their freight between the business district and the several freight stations. There are now about 30 miles of tunnel with narrow-gauge tracks operated by electric motors, and mails are now carried in this way between the railway stations and the post-office.

Railroad Tunnels.

They should, if possible, be straight, especially where there is but a single track (for with a double-track there is no chance for a head-on collision) inasmuch as collisions in a tunnel would be peculiarly disastrous. For depths of 60 ft. or less, a tunnel is rarely expedient, and an open-cut to that depth should be counted on.

The most favorable material for a tunnel is firm rock of moderate hardness and of a durable nature, especially if free from springs, and lying in horizontal strata. In soft rock, in shales (even if hard at first) and, in earth, a lining of hard brick or of masonry laid in cement-mortar is necessary.

A tunnel should have a grade in one direction for ease of future ventilation, for drainage, and for easier observation or inspection. Provided the length does not exceed 1,000 ft., no special arrangement is essential for ventilation, either during connection or afterward. Beyond that, and generally during construction, either shafts are carried up to the surface, or means are provided for forcing air through pipes from the portals. After the work is finished, however, except under peculiar circumstances, nothing of the kind is necessary.

Shafts often draw air downward, and frequently, even when aided by a steep uniform grade, do not secure ventilation. The Mont Cenis tunnel, under the Alps, completed in 1871, is 7.5 miles long, and has no shafts, although it grades up from each end, which is the most unfavorable condition for ventilation without shafts. It was made so in order to facilitate drainage, especially during construction. Ventilation is maintained by air forced from both ends. The Hoosac tunnel, in Massachusetts, is 4.5 miles long, has shafts, one of them 1,030 ft. deep, but they were put in for expediting the work by increasing the number of points of attack. If placed too near to one another the extra cost of shafts more than balances for the economy of rapidity of construction.

In excavating the tunnel itself, a heading or drift 5 to 8 ft. high and 3 to 12 ft. wide, is driven and maintained 10 to 100 ft. in advance of the main work. In rock, this heading is just below the top of the tunnel, so that men may conveniently drill holes in the floor for blasting out the rock. In earth, the heading is driven along the bottom of the tunnel, that being the most convenient for enlarging the aperature to full tunnel size, that is, by undermining the earth and letting it fall. In earth, the top and the sides of the heading must be carefully prevented from caving before the lining is built. This is done by placing side-posts or stulls and caps, with lagging to form temporary supports for the sides and roof of the excavation. This is gradually removed as the brick or masonry lining is carried forward.

The lining, when of brick, is usually from two to three bricks thick (17 to 26 in.) at the bottom, and 1½ to 2½ bricks thick (13 to 22 in.) on top. When made of rough rubble in cement, it is about half again as thick. It is important that the bricks or the stones should be hard and laid in good cement. The brick should be molded tapering to the shape of the arch, so as to give good joints. As the lining is finished in short lengths, and before the centres are removed, any cavities or voids between it and the earth should be carefully and compactly filled up.

DURING the past year special attention has been attracted to the American iron industry, on account of its remarkably prosperous condition, and by the publicity which has been given to attempts to effect a merger of important Southern iron interests. Another feature has been the commencement of active exploration work on Western iron deposits.

On Technical Writing.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

It goes without saying that careless writing is opposed to clear thinking, therefore technical men ought to be wary in their use of terms and precise in their style. Barry once said that scientific men were the only ones that had anything to say and of all people they knew least how to say it. Without further preamble, I beg to state that among the publications received last week were the proceedings of the two leading organizations of mining engineers, namely, the American Institute at New York and the Institution at London. Being interested in the question of standardization of usage in technical writing, I glanced over the pages of these bulletins to see to what extent they erred. The results are interesting, and I give them, not without fear of the thunder of the secretaries, nor without appreciating the humor of the situation. Of course, I have not written even these few introductory sentences without perpetrating some blunders and in my sequel of criticism there must be many errors, awaiting the detection of a more able critic. People that live in glass houses should not throw stones, but surely those that live in houses with windows need not deny themselves a little exercise of the fore-arm. So here goes. The first eighteen are from the bulletin of the American Institute of Mining Engineers; the second eighteen are from that of the Institution of Mining and Metallurgy. The equality of citations should prove the absence of animosity.

FROM THE INSTITUTE.

1. "In Mexico, the filter is handled by one Mexican peon per shift. These peons learn quickly and are entirely satisfactory."

The plural of *peon* is *peones*. As it is a foreign word, not yet generally accepted in English, it should be italicized.

2. "The absence of sulphides in all the ores, except in the cherty skeletons, was *very* complete."

Absence is complete or it is not. *Very* is redundant.

3. "The pay-streaks from 4 to 15 ft. *in width*, lie in well-defined *chutes* and overlapping lenses. It is noteworthy that only those *chutes* or lenses *which* now reach the surface contained calcite and manganese dioxide."

Wide would be better than *in width*. *Chutes* is wrong; according to the usage of the Institute itself, this term should be spelled *shoot*. *Which* should be *that*, for the clause limits the antecedent.

4. "The parallel shear-zones, now converted into metalliferous lodes, with extensive *chutes*, and lenses of *pay ore*, all dip toward the east."

Chutes is again wrong. A *chute* is an inclined passage for the transfer of material; an orebody of definite shape and pitch is a *shoot*. According to the style of the Institute, *pay ore* should be hyphenated. The two words are linked by an intimacy of meaning.

5. "From the size of small pebbles up to 6 in. *in* diameter."

Here it should be, preferably, "six inches in diameter;" if the small number is not to be spelled and *inches* is to be abbreviated, then it should be "6 in. diam.," which is consistent; it is also better style, because it avoids the two *in*.

6. "A *very* clean concentration of the mill-*tails*, producing a final material containing *very* low values."

Very is redundant. *Tails* is colloquial; the technical term is *tailing*. Why use the plural when only one kind of thing is meant? Moreover, no one makes a concentrate *of* a tailing; a concentrate might be made *from* such material, which would then cease to be a 'tailing,' becoming a 'middling.'

7. "The *middlings* from the second 10 stamps passed with the *tails* from the table to the vanner."

Why the plural? Here again the ugly and colloquial form of 'tailing' is employed. The use of the plural is an example of the hankering for the abstract in place of the concrete—a basic blunder in writing.

8. "It was found that the final tails were of *very* low grade; the result being *somewhat* surprising."

Another superfluous *very*. Unless we know the scale by which the writer measures the tenor of his ore, the *very* suggests a comparison without meaning. *Somewhat* is an excrescence; it is the pretence of moderation.

9. "As no copper had been found *in* the analyses, the reason for the phenomenon was *somewhat* obscure."

Here we have it again. When a man does not know what a thing is, he calls it a phenomenon; it is not *somewhat* obscure, it is *obscure;* and so is the reason for this sentence (meaning the other fellow's, not mine!). Copper is found *by* an analysis and *in* an ore.

10. "It was next attempted to size by *spitzlutten*." "The slimes were conducted into a set of 3 large spitzkastens arranged in a series."

The italics are in the text. Why is *spitzlutten* in italics and *spitzkastens* not? Both are foreign words. The plural of *spitzkasten* is the same as its singular. The numeral ought to be written *three*.

11. "In the extraction of *the final values* from the old concentrates it was found necessary to grind *them*."

The extraction of the *final values* would suit a chimera ruminating in a vacuum. You extract the metals, not the *values*, which are within the province of the accountant, not the metallurgist. The man that can grind *values*, could embrace a quadratic equation. Were there several kinds of concentrate; otherwise, why the plural?

12. "The Standard tables affording a *very* fair rough concentration, but making a *very* poor separation of *middlings* and *slimes*."

That wearisome *very*. Here it is contradictory, for a fair rough concentration is a better thing (clumsy as it is) than a *very* fair rough, etc. The reader can have no idea of the poverty of the separation, not knowing the standard of the writer in this regard; therefore, *very poor* conveys not one whit more than *poor*. Were there many kinds of middling and slime?

13. "The total cost of the treatment, including the *values* left in the *tails*, does not *materially* exceed $5 per ton."

Values may be left in *tails*, but gold and silver remain in a 'tailing' even after skillful milling. Moreover, the gold and silver escaping in the tailing do not constitute even *values*, using the term as it is used in a mining camp. The fact that it is a 'tailing,' that is, the final residue from a milling process, indicates that it has no commercial value at the time and place mentioned. This is an example of the contradictions into which that stupid word *values* will lead. *Materially* is immaterial; it conveys nothing.

14. "Such treatment of a silver-ore." "The areas are more or less removed from the present areas of zinc-ores." Why the hyphen after silver and zinc?

15. "By the economical grinding *which* is obtained with tube-mills, such *ores* as those *at* the Waihi mine will be treated mostly in the form of slime."

Which should be *that*, because the clause following defines the particular kind of grinding. Why *ores* in the plural? Does the Waihi mine produce several kinds of ore? Are the ores *at* the mine or *in* it or *of* it?

16. "Experiments are now under way with a view *of* doing the entire treatment on the filter."

It is correct to write *with a view to* and *in view of*, as is done by the same writer a few lines lower in the sentence beginning: "Especially in view *of* the fact that—"

17. "It can be reduced by about 24 per cent., viz.:— to 17 per cent."

Per cent, according to the style of the Institute, is written without a period, for it has ceased to be an abbreviation. We no longer say *per centum*. Similarly *viz* requires no period after it. Both the colon and the dash are not required; either will suffice.

18. "Charcoal, whether added at the beginning or *towards* the end of the roast, fails, etc. (Roasts *Nos.* 3 and 4.)"

The *s* in *towards* might well be omitted, as is done in a previous quotation (No. 4.) from the same source. In *Nos.* the *s* is an obvious error; never pluralize an abbreviation.

FROM THE INSTITUTION.

1. "The personal equation was certainly as important as the system of sampling *which* had been followed."

Which should be *that*, the clause is definitive; in this case reference is made to a particular system that had been followed. *Which* is non-defining and should be attached to clauses that do not limit the antecedent.

2. "In one mine two small blocks of quartz actually produced nearly as many ounces as they were calculated to have *dwt.*"

A careless bit of editing. The abbreviation is without excuse.

3. "But that was a *very* exceptional case, and in considering the *proposition one* must bear in mind what was usually *met with*."

A thing is *exceptional* or it is not; it cannot be more or less, very, or somewhat exceptional. Similarly a thing is *unique* or it is not. When in doubt, omit *very*. *Proposition* is a vulgarism that is done to death by people less educated than the members of the Institution, therefore these will do well to abstain from the use of it. In this case *problem* would serve; in other cases *proposition* is used variously as a synonym for proposal, scheme, plan, or undertaking. As to what is to be borne in mind in this case, must depend upon the particular person and not a nebulous *one*. In any event it is a nice question whether a supposititious *one* can bear in his mind anything so uncomfortable as a *proposition* when in the act of encountering a mysterious something. *Met with* in technology is rank rubbish.

4. "There are the fickle *hanging-wall* and partings to be studied and the amount of waste *rock that* is likely to fall and *water down* the mine *values*."

The wall hangs or overhangs; it is an adjective and requires no hyphen; foot-wall does. *That* is correct, which is unusual. "Water *down* the mine *values*" is a good example of sloppy writing. Do you water *up* anything? Does the writer intend to use a hose and wash the fine gold into the winze? Of course, you can do almost anything to the *value*, for it is an attribute without means of self-defence, it is neither tangible nor sensible. The writer meant that the waste (*rock* is redundant, it could not be *hay*) falling from the hanging wall is likely to decrease the assay-value of the ore.

5. In regard to hyphenation, we agree with an authority that "hyphens are regrettable necessities," and in ordinary literature it is possible to avoid the use of them, but in technical writing it will be found that many words are so linked in a single meaning that hyphenation is imperative. The degree of intimacy between words is expressed in three ways, namely, by their being written separately, as compounds with a hyphen, and as compounds without a hyphen. Thus *ore deposit* conveys two separate ideas, and we can speak of the *ore* and of the *deposit*, neither being essential to the other. In *ore-shoot*, we have a closer intimacy; the *shoot* necessarily consists of *ore;* it is only rarely that we write of cutting the *shoot* or searching for the *shoot*, the word ore being then understood. Finally, in *orebody* we have an example of a true compound, for one single idea is conveyed; it refers to the mass of ore regarded as a whole. We do not drive a cross-cut to find the *body*, but we do perform such work to intercept the *shoot*, although usually we would call it the *ore-shoot*, while there would be no hesitation in planning a cross-cut to ascertain the extent of the *deposit*.

Apparently the Institution sets small store by consistency in the use of hyphens. We find *mill bins*, *low grade roof*, *filter press treatment*, *throttle valve*, and *furnace bottom*, in all of which a necessary hyphen is omitted. In *low-grade roof* and *filter-press treatment* the error is inexcusable. On the other hand, there is a hyphen in "best-equipped properties," which is right, but in strong contrast to the omissions noted.

6. "A ½ in. *mesh* screen."

This looks sadly disjointed, and it is incorrect also. *Mesh* here is used wrongly, despite the efforts at standardization of screens, in which matter the Institution has done excellent service. *Mesh* refers to the number of apertures per linear inch; in this case it is a screen with half-inch apertures. The phrase should be written "a half-inch screen," or "a screen with half-inch openings."

7. "That ore-body had a *very* peculiar shape. It was like a cucumber more than anything else. It had *planes* in it which did not carry *values*. *One* could get samples *which* assayed 15 oz. and in a few *ft.* get no *values* at all."

The *very* is redundant; *very peculiar* expresses no more than *peculiar* unless the writer gives his notions of peculiar shape in an orebody. Such notions would be peculiar. A plane is a flat surface; it cannot carry ore *in* it; as the value of an ore is an attribute, it is conceivable that an attribute was contained within a geometrical term, but as it stands the sentence is non-sense. The writer probably means that the orebody was traversed by partings or fractures, along which ore was distributed in an erratic manner. The pestilent indefinite pronoun *one* appears in this paragrah, and we have *which* where *that* is required by grammar. Then we get an unreasonable abbreviation of feet into *ft.*; and finally there is a repetition of *values*. For once, we are pleased that the engineer got no *values;* the next time we hope he will get some *ore* or *gold* or something that is tangible.

8. In one paragraph "The delivery of water is estimated to have varied from 1,400 to 1,200 *gallons* per minute." And in the next: "The amount of water has lately increased to about 600 *galls.* per minute." Consistency is a jewel. The usual abbreviation of gallon is *gal.*, is it not?

9. "The result from the three sides *are* considered sufficient for the estimation of tonnages and values."

Are is a slip; but why the plural in *tonnages* and *values?* Does it sound more imposing? It is an extravagance that marks the careless writer.

10. "The *lode stuff* consisted of quartz in which are lumps of galena, *pyrites* and arsenopyrite."

Lode-stuff should be hyphenated; the intimacy of idea between them requires such joining. Why arsenopyrite in the singular and *pyrites* in the plural? *Pyrites* is a trade term; *pyrite* is the name of the mineral composed of iron sulphide.

11. "*Gneisses* and crystalline *schists* are the country rocks *met with*."

Why the plural? Were there several kinds of gneiss and schist? And did they come forth to greet the

writer? Apart from the inanity of this particular preposition-verb, it is an error of style to end a sentence with a preposition.

12. "The natives extract gold in *very* paying quantities."

The *very* is not required. An ore *pays* when the yield of metal exceeds the expenditure. The natives probably extracted enough gold to win a handsome profit. Why pluralize quantity? Does it indicate a greater quantity or more of them?

13. "Dissolved in about 50 *cc.* of nitric acid."

The abbreviation stands for cubic centimetre, that is, two separate words; therefore it should be written *c.c.*

14. "If the result were stated in *dwt.-inches.*"

Could anything be more ungainly than this? If pennyweight is abbreviated, why not inches? What excuse is there for a period within a word?

15. "The mine samples from the same *locations* gave 6.83 dwt."

Here *locations* is a colloquialism; either 'places' or 'spots' would be better. In mining, a 'location' is a claim that has been deliminated by pegs or monuments, according to law. Here the reference is to various places in the same mine.

16. "And if *one* knew what it was worth in gross *one* could tell what it would be worth net if *one* knew enough of metallurgy."

Here again is that mock-modest indefinite pronoun. Whatever "one knew of metallurgy" the particular one that wrote this ought to know that such hazy talk is bad technical writing.

17. "Of course, it was *very* necessary to do sampling and to do it *very* well."

The weary iteration of that silly little *very!* Compare the strength of the sentence when written without the *very*, thus: "It was necessary to sample and to do it well."

18. "A block of ore is considered as being developed or "*in sight*" when it has three sides exposed."

The Institution has formally anathemized 'ore in sight'; most properly. Why then permit the use of it in its own transactions? Of course, the double quotation marks might suggest an apology, but it would have been easy to substitute 'in reserve;' furthermore, the double 'quote' is used in the same bulletin to indicate a term that is admissible but not regular, as in "clean up." This affords an example of the usefulness of the single 'quote' to indicate uncommon terms, leaving the double marks for actual quotations. Thus 'clean-up' would indicate that the word was colloquial or local or unusual in some other way, while "clean-up" would mean that it was quoted from another man or some preceding statement.

Apart from the fun of it, I have undertaken to make these criticisms in order to call attention to the desirability of standardization in technical writing, by agreement as to certain spellings and usages. I close with my compliments to the editors in New York and London, and the assurance of my most profound esteem.

SINCE magnesia is the most refractory of the commonly occurring oxides, it is surprising that it is not more widely employed for the construction of vessels capable of withstanding high temperatures. Up to the present, however, ordinary calcined magnesia has been found none too well suited for this purpose. Magnesia bricks, crucibles, etc., of nearly all makes require great care in handling, and it is particularly necessary in furnace work to heat them evenly and slowly, otherwise fracture occurs.

Electricity in Iron and Steel Metallurgy.

There are those who look forward to an electrical method of producing iron and steel. If any practical system of this nature for converting iron-ore into pig-iron or steel could be introduced, using the stored-up powers of Nature instead of burning carbonaceous fuel, the revolution in practice would be great. Probably more than one hundred million tons of coal, equal to about one-seventh of the world's total output, are used annually in the smelting of iron, to say nothing of the further large quantities employed in the subsequent working of iron and steel into more finished form. Where water-power and suitable iron ore can be found together, no doubt, satisfactory electrical smelting practice will be developed, but this can only come slowly.

Pioneer work is being done in Sweden, France, and Canada, in electrical smelting for the production of steel, but unless water-power can be obtained at economical rates it would seem that the application of this system must remain very limited; that other sources of power should be used at present appears to be out of the question from an economical point of view. Moreover, the electric furnace does not purify steel more than other furnaces not specially adapted to that purpose. Bad steel can be produced by it as easily as by the ordinary processes. Some of us know how often the old type of crucible-steel melting, so largely practiced in Sheffield, has been threatened with extermination, but more material is now produced in this way than ever before. The electrical system has in this older method, notwithstanding its extraordinary wastefulness, a competitor that will not soon be annihilated.

An important question in connection with electric furnaces is, whether they can ensure uniformity of temperature. It is well known that they are apt to produce steel which is much colder at the top of the molten bath than underneath; this is, of course, objectionable. Of the many failures with electric furnaces we hear little; it would be interesting to know more about them. I say this in no disparagement of a 'young' process, but to prevent the uninitiated being dazzled by the mere term 'electric.'

It is stated that the efficiency of the electric furnace is already comparatively high, say 50%, but under present conditions it would still be more expensive to develop heat, at any temperature within the range of a coal-fired furnace, by electricity than by coal—that is, if electricity has to be generated by steam-power, even with plant of the highest efficiency.

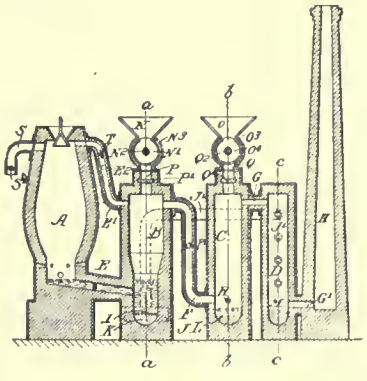
The electric furnace has a range of temperature of about twice that of the ordinary steel furnace, so that it will extend up to about 3,000° C. Reactions which take place within certain limits of temperature as now practiced may be reversed at the higher range made available by the electric furnace.—R. A. Hadfield.

THE greatest care is necessary in the design, construction, and maintenance of a condenser system to keep it free from air leakage. The leaks are inward, therefore invisible, and hard to locate. The application of two or three coats of paint on clean surfaces will eliminate many of the leaks in exhaust-pipe lines, but there still remain several places for air leaks which are not so easy to remedy. The stuffing-boxes on the rods and exhaust-valve stems of the low-pressure cylinder are apt to leak. This trouble, however, can easily be eliminated by using double metallic packing on both rods and valve stems, and piping the steam from the receiver to the space between the two sets of packing, thereby forming a steam seal on the rod.

MINING AND METALLURGICAL PATENTS.

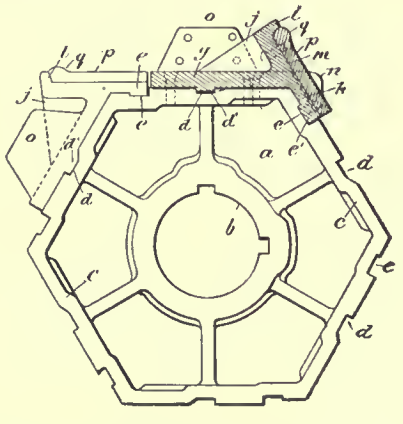
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PROCESS OF OBTAINING METALS FROM SULPHIDES.—No. 844,452; Thomas J. Heskett, Brunswick, Victoria, Australia.



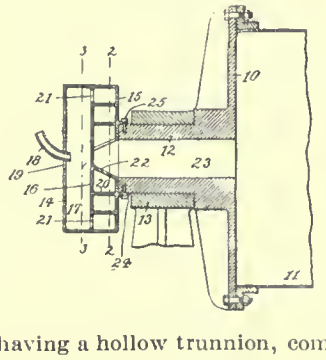
The process of obtaining metals from sulphides, which consists in oxidizing and desulphurizing the melted ores in an oxidizing-chamber, precipitating the unoxidizable metals and collecting them in the bottom of the chamber, passing oxides of the metals and the sulphurous-acid gas in a highly heated condition into a reducing-chamber, there bringing the oxides and sulphides into contact with a reducing material, collecting the less volatile metals at the bottom of the reducing-chamber, passing the more volatile metals to condensing-chambers, and there precipitating them in the order of their condensation.

UPPER TUMBLER FOR DREDGES AND THE LIKE.—No. 845,795; Samuel L. G. Knox, Milwaukee, Wis., assignor to The Bucyrus Company, South Milwaukee, Wis., a Corporation of Wisconsin.



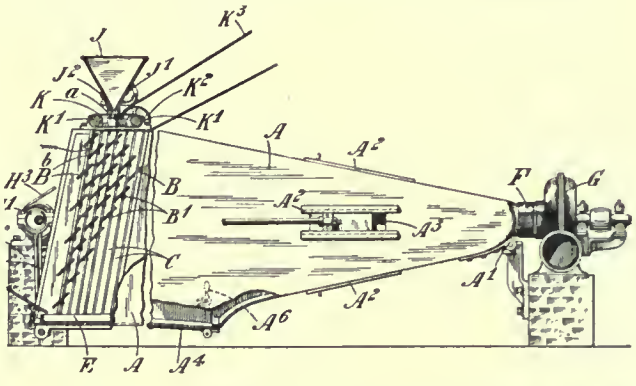
A tumbler for bucket-chains, comprising a polygonal drum, a wear-plate on each face to engage the bucket-chain, and a transverse shouldered engagement between the wear-plates and the drum-faces to resist the tangential strain of the chain.

FEEDING DEVICE FOR BALL-MILLS.—No. 845,992; Max F. Abbé, New York City.



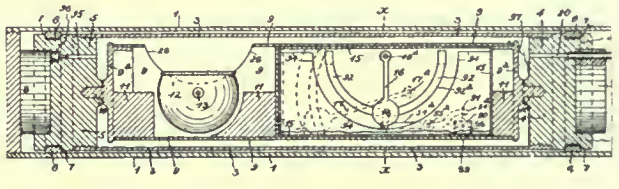
A ball-mill having a hollow trunnion, combined with an exterior cylindrical casing composed of a perforated outer wall, an inner wall, an intermediate perforated partition, a feed-chamber between outer wall and partition, a spiral conveyor between partition and inner wall, said conveyor having a flaring central convolute that opens directly into the outer end of the hollow trunnion, and means for coupling the casing to said trunnion.

SEPARATION OF METALS FROM THEIR ORES.—No. 844,620; Richard E. Saunders, London, England.



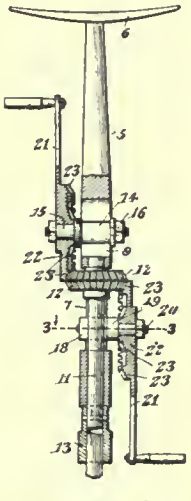
In apparatus for the separation of the metalliferous constituents of ore from gangue, the combination of a casing, an exhaust-fan flexibly connected to one end of said casing, a hinged support for that end of the casing, means for vibrating the other end of the casing, regulatable openings in the casing, adjustable baffles within the casing, and a hopper for feeding crushed ore to the baffles, and an inclined tray extending from the front of one compartment to the other.

INSTRUMENT FOR SURVEYING BORE-HOLES.—No. 845,875; Percy E. Lewis, Johannesburg, Transvaal, assignor of one-fourth to Luther Cyril Franck, Johannesburg, Transvaal.



In an instrument for surveying bore-holes, the combination of an indicator, a casing inclosing the same, means for fixing the indicator and means for changing the pressure of the air or gas in the casing to actuate the means for fixing the indicator.

MINING-DRILL.—No. 845,898; Jasper N. Rickles, Altoona, Alabama.



In a drill of the character described, the combination with a supporting-frame, of a shaft journaled therein, said frame having a longitudinally-disposed slot at one side of the shaft, a bracket slidable on the frame and extending over the shaft, fastening means for the bracket passing through the slot, a gear mounted on the shaft, and a gear mounted on the bracket intermeshing with the gear of the shaft.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Grants Pass, Ore., marked R. T., is Rhyolite.

THE specimens from C. S., of Oakland, supposed to be Topaz, have not been received.

The two specimens from Los Angeles marked H. N. S. are crystallized brown Garnet and massive white Gypsum.

The pink platy mineral in serpentine, sent by D. F. C., of Redding, Cal., is a chlorite, probably Kammerite, a variety of Penninite.

The powder from Barkerville, B. C., marked F. T., is earthy Limonite, or brown ochre. The value would depend on its purity, situation, *et cetera*.

The specimens from Ely, Nev., marked E. S. D., are: No. 1, Garnet rock; No. 2, serpentinized rock containing Pyrite; No. 3, Granite; No. 4, Epidote; No. 5, Garnet.

The soft white mass from Dayton, Nev., marked C. G. T., is from a deposit of fine silica and clay, and contains a little carbonate of lime. It may have Gypsum veins traversing it, but the deposit would not grade into Gypsum.

A. B. C., of Battle Mountain, Nev., sends: No. 1, an impure greasy Talc, or Serpentine; No. 2, glassy Pitchstone, or Obsidian, with feldspar crystals; No. 3, Andesite, with glassy feldspars, black Hornblende and Biotite visible in the dense groundmass.

The rocks from Chilpancingo, Mex., marked E. E. N., are: No. 1, Mica-schist; No. 2, Gneiss; No. 3, Mica-schist; No. 4, Pegmatite; No. 5, Schist; No. 6, altered volcanic, probably Rhyolite; No. 7, carbonaceous Shale; No. 8, Quartz-porphyry; No. 9, altered Schist; No. 10, 11, and 12, altered volcanics, probably Rhyolite.

TANTALUM, in Western Australia, was first discovered in 1894, when the rare mineral stibio-tantalite (tantalate and niobate of antimony) was identified in the tin washes of the Greenbushes tinfield, near Bunbury. In 1900 tantalite (tantalate of iron) was discovered in the concentrates at the same place, and shortly afterward large deposits of mangano-tantalite (niobate and tantalate of manganese) were found on the Wodgina tinfield. Wodgina is situated on the Pilbarra goldfield, about 160 miles inland from Port Headland. The introduction of the Siemens & Halske tantalum light furnished a market for the mineral, and in 1905 over 70 tons, valued at £8,925, were exported. This ore contains from 68 to 70% metallic tantalum. The market fell away toward the end of the year, and at present there is no official market obtainable for tantalum ores. Although it is popularly supposed that the only use for tantalum is in the manufacture of filaments for electric lights, this is by no means the case, for tantalum possesses properties that render it an important factor in steel alloys. Tantalum is a hard gray metal, somewhat heavier than iron, and is markedly ductile. At the same time, when hammered, it becomes harder than the hardest steel, and has even been suggested as a substitute for diamonds in diamond-drilling. Only a very small percentage of tantalum is required in these alloys. It is believed that Krupps are experimenting in this matter, and that they, or some other German firm, are making every effort to 'corner' the Wodgina fields.—*Electrical Engineer.*

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A valid location of a placer claim may be made where there has been an actual discovery of gold upon each of several claims located. And where it appeared in addition to this that such claims were situated near other lands presenting the same surface indications, which at the date of the location of the claims in dispute, were known to be valuable for the placer gold which they had contained; and where it appeared from the evidence of expert miners that the indications, together with the relative location, were sufficient to justify the expenditure of money in their explorations, with the reasonable expectation that, when developed, they would be found valuable as placer mining claims.

Lange *v.* Robinson, 148 Fed. 799.

No inference of negligence on the part of a mining company can be drawn from the fact of an accident; neither can liability be based on defective machinery or appliances, that had no connection whatever with a subsequent and different accident causing the death of a miner.

Leonard *v.* Miami Min. Co., 148 Fed. 827.

Where a person makes a valid mining location, he need not keep actual possession of the claim, but his right of possession will continue until he in fact abandons or forfeits it by failure to do the work required by law. The burden of proving a forfeiture or abandonment in such case is upon the party asserting it. Such a forfeiture can only be established by clear and convincing proof of the locator's failure to perform the labor required by the statute, and the burden rests upon the party asserting such failure, and this is a question of fact.

Gear *v.* Ford, (Cal.) 88 Pac. 600.

Where the original locator of a mining claim suspended work for four years, and an adverse location was then made, money expended by the first locator in employing watchmen for the premises, was not a compliance with the statute requiring not less than $100 worth of work to be performed or improvements made during each year. But where the locator did work in good faith for the purpose of developing the mines, in strict compliance with the statute, a court is not justified in substituting its own judgment as to the wisdom and expediency of the method employed in the development, in place of the owner's.

Gear *v.* Ford, (Cal.) 88 Pac. 600.

A real estate broker found a person who took an option on the purchase of certain mining property. The owner of the property died before the option expired, and was therefore never closed. The administrator of the deceased owner, after the expiration of the option, sold the property to the same person, at the same price. It was held that the broker could not recover his commission.

Crowe *v.* Trickey, 27 Sup. Ct. 275.

The owner of lands in his life time executed a mining lease and the lessee took possession. In a suit for partition by the heirs of the deceased lessor, it was claimed by one heir that the lessee was in possession of a certain portion of the property not included in the lease. It was held that a rule could not issue against the lessee for the purpose of construing the lease and requiring him to appear and show cause why a writ could not be issued requiring him to deliver possession of the property in dispute.

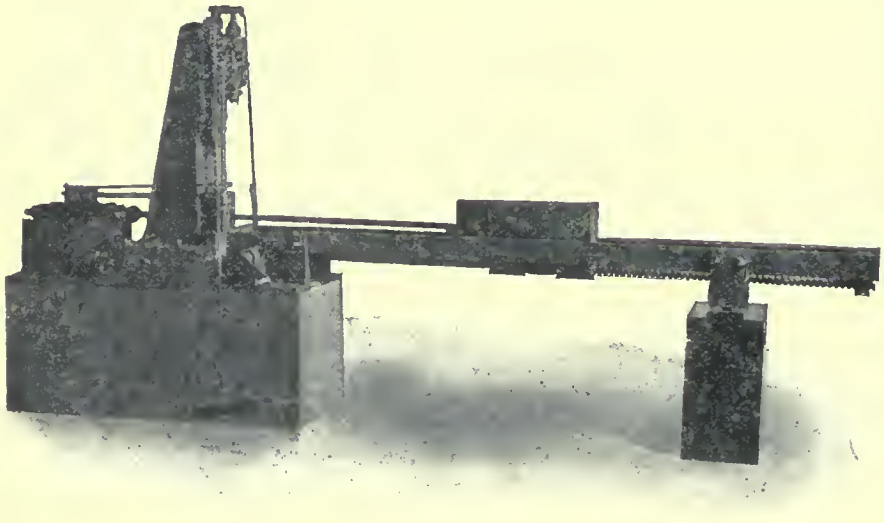
Mounts *v.* Mounts (W. Va.), 56 S. E. 358.

An election by the grantee of a patent for a lode-mining claim to abandon rights acquired under the Act of 1866 could not be assumed from the fact that the patent, in addition to granting such rights, also purported to grant all that would have been acquired by a location under the Act of 1872.

East Central &c. Min. Co. *v.* Central Min. Co., 27 Sup. Ct. 258.

Hammer-Drills.

The increased use of hammer-drills throughout the country has created a demand for a drill-sharpener that will forge and sharpen drills from the blank bar up to eight feet long. The improved Ajax drill-sharpener, A 86 size, illustrated herewith, is designed for sharpening four-wing bits for both hammer and piston drilling-machines, and will sharpen hand-steel as well. It is claimed by the manufacturer, T. H. Proske, of Denver, that the four-wing bits, as made with this machine, will give better results than the rosette, or 6, 8, or more cutting-edge bits ordinarily used in hammer-drills. This machine weighs 2,500 lb., and can be operated with ease by one man. It is specially adapted for use on mines employing a limited number of drills, whether hand or machine. The construction of the improved Ajax is simple, and consists of the main bed-frame to which is attached the dollie or upsetting hammer, and upon which rests the frame for the upright or swedging hammer; this bed also forms an anvil-base for the anvil-die. The take-up screw, for shifting the tail-block back and forth for the different lengths of drills, is journaled into this, and is operated by a crank and a pair of bevel gears, within easy reach of the operator. The tail-block for holding the shank of the drill, while being upset with the dollie, is supported by rollers that travel inside of two pieces of channel-steel which, at their outer end, are supported by a concrete pillar as shown. It will be seen that the working parts of this machine are very few, and they are all contained within and upon the main bed-frame, which is placed upon a solid concrete pillar. The D 24 size machine is the same as the A 86, except that it is made much stronger, being built in proportion to the size of its hammers. This machine is for making both four-wing and chisel-bits from 1½ to 4 in. or more in diameter, and is made in lengths to sharpen drills from 18 in. to 15 ft. Special long machines can be made for drills of any length up to 50 ft. long.



Ajax Drill-Sharpener.

Commercial Paragraphs.

COMPRESSED AIR MACHINERY CO., of San Francisco, report that they have shipped a Word Bros. drill-sharpener to Cranberry, Conn., also one to Loomis, Washington.

VICTOR M. BRASCHI & CO., of Mexico City, has opened a branch at Torreon, Coahuila, in charge of Chas. F. Parker. This is due to the firm's increasing business in the mining machinery required for northern Mexico.

THE DENVER ENGINEERING WORKS CO. has moved its Salt Lake City office from 416 Dooly Block to 205 Atlas Block. The steadily increasing business, under the able management of L. G. E. Bignell, has necessitated more roomy quarters.

BRODERICK & BASCOM ROPE CO., St. Louis, Mo., makers of the famous Powersteel wire-rope and aerial wire-rope tramways, will move their New York office on May 1, from 19 Murray St. to 76 Warren St. Their business in New York has increased so much that they find it necessary to seek larger quarters. C. A. Dunlavy is their Eastern manager.

L. S. PIERCE, 1650 Champa St., Denver, the manufacturer of the Pierce amalgamator, has received the following letter from Robeson & Carter, lessees, Smuggler-Union mine, Telluride, Colo.: "We take pleasure in testifying that we have used the Pierce amalgamators for the past 11 months in the Smuggler mill of 60 stamps of the Smuggler-Union Mining Co., which has been leased by us. The pulp passes through the Pierce amalgamator directly after leaving the plates. During the above named period we saved in the Pierce amalgamator 4,764 oz. bullion, averaging in value $14 per oz. We can strongly recommend their use to persons having ore of a similar character to treat." The amount saved is $66,696 in eleven months, below their plates and quicksilver traps.

Trade Treatises.

THE COLORADO ASSAYING & REFINING CO., of Denver, sends us a little book on determining metals in ores.

THE PACIFIC HIGH EXPLOSIVE CO., of Oakland, Cal., issues a pamphlet describing their Trojan powder.

THE JEFFREY MANUFACTURING CO. of Columbus, Ohio, has issued two bulletins, B and C, describing coal and ash-handling machinery for power plants. They are illustrated by photographs of plants in which these machines are used.

THE FORT WAYNE ELECTRIC WORKS, of Fort Wayne, Ind., has sent us Bulletins No. 1087, 1089, and 1090, describing the Wood systems of direct-current arc-lighting, standard direct-current switchboard panels, and standard alternating-current switchboard panels for single-phase circuits, and various electrical appliances. The bulletins are well arranged, and contain many illustrations and valuable working-drawings for wiring electrical circuits and switchboards. Accompanying the bulletins is an instruction book for the Fort Wayne series A. C. arc systems, and an index to Bulletins No. 1001 to 1089.

A. VAN DER NAILLEN JR., for 25 years a civil engineer of San Francisco, and at present manager of the Van der Naillen School of Engineering, established since 1864, and who several years ago was Commissioner of Board of Public Works, in an interview recently said, in part: "Although the late calamity has brought great loss and distress to many, it has also brought great benefit to many of the working class, and especially to young men who had some knowledge in either civil, electrical, or mining engineering, surveying, draughting, etc." He stated "never before have we seen large posters on the walls of San Francisco, or firms advertising for draughtsmen, wages no object. Our institution, which was re-opened in Oakland shortly after the fire, was almost transformed from an educational institution into an employment office, as the demands came in so rapidly for help in all engineering branches, not only for graduates, but for men who only knew something about electrical work, surveying, drawing, assaying, etc. Many of these calls were from the interior towns. Since April 24 I have sent out nearly 160 students, many of whom had hardly been with me more than several months. Our enrollment list shows over 200 students, yet a visit to our school at the present time would scarcely show an attendance of more than 40, and these prefer to finish their course, or I could place them also."

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Editorial.

RECENT violent breaks in the prices of stocks on Wall Street have been imputed to various causes besides the increasing stringency of the money market in Europe and America. It is due largely to the colossal gambling of a few unscrupulous men, whose operations tend to become a constant menace to the stability of our financial institutions, whether they be banks, trust companies, insurance corporations, or railroads. Men of poor judgment and great daring are in control of forces, the momentum of which is becoming intensified as wealth grows. The performances of Jay Gould and Fisk, a generation ago, are being reproduced on a bigger scale.

SOME of our readers will have received a circular inviting them to subscribe to some oil stock in an Eastern State. Among other statements was one asserting that the Jamaica earthquake had increased the flow of oil from wells in northern Texas and Louisiana, by reason of a favorable disturbance among the subterranean strata. This is a geological myth. But no scrap of half-knowledge is too flimsy to serve the purpose of promoters.

AT THIS TIME the State Mining Bureau of California and the similar departments in other States are sending statistical blanks to the persons and companies that produce mineral substances. The information thus obtained is regarded as confidential and is used only in estimating the total production of the county or State. The managers of mines and smelters ought to reply to these requests for information in the spirit with which they are sent, namely, to afford information useful to many and injurious to none.

OUR CONTEMPORARY, *The Iron Age*, refers to the waste in trade literature, in the form of catalogues and descriptive matter, that is never read, nor even examined, by a large portion of those to whom it is sent. There is also a great deal of waste in the imitation technical periodicals that some machinery houses publish for the specific purpose of doing their own advertising. Not much of this stuff is effective. Busy men never read it. Those who have the responsibility of buying machinery are content to read one or two technical papers of the highest character, and if the machinery man wants to arrest his attention, it can be done on the regular advertising pages of such periodicals, which are carefully perused, and in which the distinction between the write-up of the manufacturer and the testimony of the engineer is carefully maintained.

SUCH a break-down of railroad transport as we have seen lately in California by reason of floods, emphasizes the neglect of our rivers as arteries of traffic. There

was a time when the Sacramento did notable service as an avenue of trade, but owing to the neglect of this and other waterways, through lack of maintenance of the levees and insufficient dredging, the commerce of the State is crippled each time the rainfall happens to be excessive. This loss of service is due mainly to the railroad companies, the policy of which is to have the rivers useless for navigation, thereby strengthening their hold on the business of transportation. In many countries, such as England and Germany, the river systems play a notable part in the traffic of the interior and a useful check is thereby maintained against the exactions of the railroads and the congestion of traffic. If San Francisco in particular and California in general are occasionally paralyzed by the temporary disruption of the highways of commerce, it is due to a short-sighted policy and the corrupting hold of the railroad companies. In the same way, despite the chronic interruption to railroad communication with Los Angeles, the steamboat service is not used as much as it might be, because it is not as good as it ought to be, for the sufficient reason that any attempt to make it an effective competitor of the railroads, would be followed by vigorous action on the part of those in control of the transportation system of the State.

Mining Engineering.

THE growth of mining as an engineering problem is made manifest in these days by the magnitude of the ore reserves in some of the copper mines of the West. There was a time, twenty years ago—or even ten—when anyone who spoke of a million tons of ore 'in sight' was regarded as an ignoramus or a knave, for in those days such statements were not true, and they appeared only in the irresponsible descriptions of a flamboyant prospectus or in the careless talk of a middleman intoxicated by the exuberance of his own scheming. Other times, other facts. Many mines can now show, blocked out and ready to stope, more than the apochryphal million tons of a by-gone promoter's dream. But, as if to suggest that we have done with the loose talk of an earlier day, we no longer say that the ore is 'in sight,' which, manifestly, it is *not* until in the bins, but we label it 'in reserve,' or 'blocked out,' or 'ready for stoping,' all of which are phrases that keep alongside the reality. They indicate that the irregular mass of ore or the tabular body of it between the walls of a vein is exposed on two, three, or even four sides, sufficiently at least to afford conclusive evidence as to the tonnage available. It is on the amount thus assured that the engineering operations are based, and it is because that amount is so large in many modern mines that it has become possible to devise comprehensive schemes of exploitation and reduction. For instance, in the mines of the Nevada Consolidated Copper Co. there is blocked out no less than twenty-two million (22,000,000) tons of ore, of an average copper content of 2.31 per cent, from which an average recovery of 33 pounds of copper per ton is practically certain. This ore occurs in two separate and disconnected masses, the orebody in the Ruth mine being estimated at 6,000,000 tons of 2.6 per cent copper ore. In concentrating by water the loss is expected to be 25 per cent, or 13 pounds per ton of ore, the further loss by smelting (and converting) being estimated at 14 pounds per ton of concentrate, on a concentration of seven into one; thus the total loss is 15 pounds and the estimated recovery is 37 pounds of copper per ton. The other orebody, in the Copper Flat mine, is estimated at 16,000,000 tons of ore averaging 2.2 per cent. In working this ore the loss in concentrating will be 11 pounds per ton of ore, and in smelting (and converting) 18 pounds per ton of concentrate. The concentration will be in the ratio of nine to one; therefore the total loss is estimated at 18 pounds and the recovery at 31 pounds of copper per ton. By working two tons of Copper Flat ore and one of Ruth ore, the average yield will be 33 pounds per ton. The two orebodies are of entirely different shape and will be mined by different systems. That in the Ruth has an average width of about 200 feet; it has been developed for a length of about 1,000 feet and goes down to a depth of about 580 feet below the surface. Of this 580 feet the first 180 feet below the surface has been leached and is valueless. The orebody dips at an angle of about 40°. On the other hand, the Copper Flat orebody is a flat deposit, about 900 feet wide by 1,100 feet long and 200 feet thick. The cap at the thinnest point is 25 feet deep and at its thickest it is 150 feet, that is, the orebody is nearly horizontal and does not conform to the surface contour. This cap will be stripped by steam-shovel and the ore itself will be worked by this system at a total cost for mining and development of 30 cents per ton. The Ruth orebody will be worked by the caving system at a total cost, for mining and development, of 90 cents per ton. Mining two tons of Copper Flat steam-shovel ore to one ton of Ruth caved ore makes the total cost, including all development work, of 50 cents per ton. The concentrating and smelting plant now under way is designed to have a capacity of 4,500 tons of ore per 24 hours. This means the smelting of about 550 tons of concentrate per day. These facts are given because they are interesting and for no other reason; most of them have been stated before in other publications, but with less exactness.

The orebodies occur in a zone of impregnation, limited in vertical extent. How far it goes, remains yet to be proved. This is the largest tonnage of ore available in any one mining property, as far as we know, with the exception of Rio Tinto, which is said to be capable of producing a million tons per annum (the present rate of output) for a hundred years. In the Transvaal there are mines with as much as ten million tons of ore assured, for example, in the Simmer & Jack and the Robinson Deep, and this is why methods on the Rand have been developed to so high a degree of efficiency. We have mentioned the great mine at Ely, in Nevada, for the reason that its true character as a low-grade proposition was recognized by several experienced mining engineers, who then went to work in thorough fashion to test the size of it, expecting that either it would be proved too small for the

large scheme of operations required to secure a low working cost, or it would be demonstrated to afford the means for bringing such an enterprise to successful fruition, that is, commercial success. Fortunately, chemical activity and geological structure had inter-acted with sufficient intensity to produce an ore measure of such extraordinary dimensions, although of humble tenor, as to give Mark L. Requa, F. W. Bradley, J. H. Mackenzie, and J. Parke Channing the material upon which to base a plan of mining and metallurgical operations on a tremendous scale. Total costs can be brought to seven cents per pound of copper produced, because a comprehensive scheme can be applied by the aid of the most elaborate machinery, and this in turn can be purchased freely because the security for it exists in the mine. After all, the first requisite for good engineering is the stuff to operate upon, and that is exactly why mining engineering so often lacks the perfection or the completeness of other branches of the science. Is it any wonder that a manager should be careless over the saving of five cents per ton in his working cost when the assay-value of his ore fluctuates by five dollars? His energies are so fully occupied in finding the richest ore that he is bound to subordinate the question of a minimum cost. But give him the stuff to work upon and a reasonable margin in the way of contents, so that he knows he is to deal with a product of a certain kind; then indeed he can suit his methods to his ore and the scale of his operations to his tonnage. That is mining engineering.

TIME WAS when tellurides were regarded as the indication of rich veins of a non-persistent character. In Transylvania, in New Zealand, in the Boulder and La Plata counties in Colorado, in Shasta and Calaveras counties, California, there were numerous occurrences of telluride ore, which were satisfactory as far as they went, but that was not as deep as gold-bearing quartz of other kinds. Cripple Creek and Kalgoorlie proved that tellurides could go deep enough to make magnificent mines and today profitable ore is being broken in these districts between 1,500 and 1,900 feet, with signs of impoverishment at the bottom levels. The matter is of interest in relation to the ore deposits of Tonopah and Goldfield, where gold exists in combination with tellurium, as well as in native form. Apart from the fact that these minerals are not confined to the upper portion of gold veins, there is geological evidence to prove that tellurides may be formed at a depth of several thousand feet below the surface. At Cripple Creek, according to Waldemar Lindgren, the deposition was largely in the nature of fissure-filling and it was not a deep-seated process; there the tellurides occur in crystalline form. At Kalgoorlie, the tellurides are massive and associated with tourmaline, magnetite, and albite, in such a way as to indicate deposition far below the surface. The general evidence goes to prove that no generalization can be based on the presence of tellurides and that persistence in depth is contingent upon structural conditions and the intensity of the thermal activity to which is due the precipitation of metallic ore.

By the Way.

A recent issue of *Nature* contains some interesting observations on the distribution of radium. It says:

When considering the influence of radium on earth history, it is generally assumed that the radium detected everywhere in the surface materials of the earth is an original constituent of the igneous rock. A recent study of the matter has led J. Jolly to a different view, as there seems to be difficulties in the way of accepting the original or primary nature of the radium in rocks. The original nature of the radium cannot be maintained without at the same time assuming the presence of the associated uranium to make good the radioactive decay. If such uranium existed, difficulties would arise from the facts of solvent denudation. The ocean receives the dissolved rock materials, and even assuming geological time as only a very few million years, according to this explanation the quantity of radium now in the ocean should be much greater than has been observed. If the river supply of dissolved rock materials had been sustained for only 20,000,000 years, sea-salt should possess a richness twenty-five times as great as the ascertained amount. In making this statement it is assumed that the radioactive substances are removed from the land along with other mineral matter, and that along with the radium brought into river water on the break-up of rock minerals the postulated uranium is also carried to the ocean. R. J. Strutt has estimated that the radium in sea-salt is 0.15×10^{12} gram per gram. From this there must be in the ocean about 8×10^{9} grams. From Boltwood's experiments, to maintain this quantity of radium in the ocean there must be brought into it annually 1.78×10^{6} grams of radium. Taking the accepted figures for the total volume of river water and the dissolved matter therein which annually enter the ocean, and assuming that the matter in solution possesses the mean radium content of the igneous rock, it is found that only 10^{4} grams should enter the ocean annually in the waste of the land. This is not nearly what is required to maintain the oceanic radium at its approximate present value.

If the associated uranium enters along with the radium there would be in 800,000 years an accumulation of uranium in the ocean sufficient to account for the existing amount of radium; but evidently this period is too short geologically. For these reasons the author seeks to explain the presence of radium in other ways. The simplest explanation is that there is no associated uranium generally distributed throughout the surface materials of the earth. Exception, of course, must be made to the orebodies and thermal springs, and to certain igneous masses which contain uranium. The radium cannot come from volcanic sources, nor can it reach the surface as ores in general do by means of fissure veins. By a process of exclusion the author thinks that he is justified in considering the possibility that the radium is picked up by the earth in its motion through space. The probable source of it is the sun, and there are arguments in support of this view besides that of exclusion. The radium is fairly uniformly distributed over the earth's surface, and it would be expected that the more impervious mineral substances would show the least amount, as has been found to be the case by Strutt. There appears to be no improbability that matter in minute quantities might reach us from the sun, and here we are observing the most minute traces. If the observations are correct as to the velocities of solar ejections, it would take but a few days to bring solar matter into the orbit of the earth. Sun-spot weather action may also be involved, as well as the phenomena of atmospheric radioactivity.

Personal.

THOS. B. STEARNS is at New York.

ERNEST L. ADKINS is assayer at Mullan, Idaho.

GUSTAVE SCHRADER is at Sutter Creek, California.

NORMAN C. STINES is examining mines in Lower California.

W. C. NESBITT is with the Yankee Con. Mining Co. at Eureka, Utah.

W. H. MCDOWELL is with the Traylor Engineering Co. at Kimberly, Nevada.

E. S. SCHRADER, lately with the Bald Butte Mining Co., is at Helena, Montana.

WILLIAM FORSTNER has been examining mines in Siskiyou county, California.

A. C. DE JONGH is at Telluride, Colo. He will go to Houghton, Mich., shortly.

D. E. BIGELOW is consulting engineer with Bewick, Moreing & Co., at Melbourne.

DUNCAN TURNER is employed in the mill of the Tonopah Mining Co. at Millers, Nevada.

WILLIS LAWRENCE is superintendent at the Picacho Basin mines, at Yuma, Arizona.

RAYMOND A. FULLER is assayer with the Penn Chemical Works at Campo Seco, California.

GODFREY D. DOVETON has returned to Denver from a four months' engagement in Mexico.

R. M. BAGG, JR., is temporarily employed with the Portland Gold Mining Co. at Cripple Creek.

J. W. MERCER is in San Francisco, on his return from examining mines in southern California.

W. B. ROUNTREE is now smelter superintendent for the Mountain Copper Co. at Martinez, California.

AUGUSTINE LAWRENCE, lately with the Mariposa Commercial & Mining Co., is now in San Francisco.

ARTHUR GOODALL, manager of the Fremont Con. Mining Co., of Amador City, is visiting San Francisco.

WOOLSEY MCA. JOHNSON is metallurgical engineer for the Tri-Bullion Smelting & Development Co., of Chicago.

FRANK ROBINS is at the nitrate mines in Death Valley, being consulting engineer for the Pacific Nitrate Syndicate.

SEWALL TRUAX has lately been appointed manager of the Grenadeña Mining Co. at Santa Barbara, in Chihuahua, Mexico.

WILLIAM A. HEYWOOD left London on March 6 for a two years' engagement with the Spassky Copper Co. at Akmolinsk, Siberia.

C. L. NEWCOMB, JR., has been appointed manager of the Western office of the Platt Iron Works Co., with offices in the Monadnock Bdg., San Francisco.

D. P. MITCHELL, lately manager of the Oroya-Brownhill mine at Kalgoorlie, is now general manager of the Melbourne office of Bewick, Moreing & Co.

H. A. PARKER has returned to Los Angeles after spending six months examining mines in Arizona; he has now joined the staff of the Blaisdell Company.

EDWIN C. ECKEL has resigned from the U. S. Geological Survey to go into general practice as expert in cement material. His office will be at Washington.

E. M. MCILVAIN, formerly president of the Bethlehem Steel Co., has been elected president and general manager of the Robins Conveying Belt Co., Park Row Bdg., New York.

E. G. DEWALD has resigned as manager of the Western office of the Platt Iron Works Co. and will return to Dayton, where he will be manager of the water-wheel department of the same company.

T. A. JAGGAR, JR., of the Massachusetts Institute of Technology, accompanied by ARTHUR EAKLE, of the University of California, will go to the Aleutian islands, leaving San Francisco on April 20.

PHILIP ARGALL has completed his engagement as consulting metallurgist to the Golden Cycle Mining Co. and is now busy designing two plants for the treatment of ores at mines in the Cripple Creek district.

J. B. FLEMING, well-known as the designer of the Detroit Copper Mining Co.'s concentrator, at Morenci, Arizona, and also of the Silver King mill at Park City, Utah, is now associated with the Joshua Hendy Iron Works, San Francisco.

H. E. NELSON, who has been superintendent of construction for the Golden Cycle mill at Colorado City, has resigned to take charge of the construction work of the new mill of Stratton's Independence at Victor, in the Cripple Creek district.

W. E. DEFTY who has been general manager for two years for the Mina Juarez, in Sonora, now resigns that position, but holds his connection with the company as its consulting engineer. Mr. Defty desires to devote more time to other branches of his profession.

ALLIS-CHALMERS CO. state that for some time past the Smuggler Union Mining Co., of Telluride, Colorado, has been operating a No. 5 K Gates ore-breaker, driven by an Allis-Chalmers motor, in one of its tunnels, for the reduction of ore underground to a convenient form for handling, before it is lifted to the surface. This device has answered the demands put upon it so adequately that the Smuggler Union Mining Co. has recently ordered an additional crusher, a No. 4 Gates type K machine, to be used for the same purpose as the older equipment, and to be driven also by an Allis-Chalmers 20-h.p. induction-motor of standard design.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, March 28.

Argonaut	$4.80	Central Eureka	$0.65
Con. Virginia	0.98	Savage	0.78
Mexican	0.66	Sierra Nevada	0.66
Ophir	2.27	Yellow Jacket	0.77
Belmont	4.75	Midway	1.75
Combination Fraction	4.17	Montana	3.55
Goldfield Con	8.06	Mohawk	16 50
Jim Butler	1.16	Nevada Hills	3.50
Jumbo	3.75	Red Top	3.50
Jumping Jack	0.14	Sandstorm	0.52
Manhattan Con	0.70	Silver Pick	1.18
Manhattan Dexter	0.23	Tonopah Ex	3.75

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
March 22	25⅛	6	6⅞	66¼
" 23	25⅛	6	6⅞	66⅜
" 24	Sunday.	No market.		
" 25	25	6	6⅞	65⅞
" 26	24¾	6	6⅞	65⅞
" 27	24¾	6	6⅞	66⅛
" 28	24¾	6	6⅞	66

CURB QUOTATIONS—NEW YORK.

	Closing Prices March 21.	March 28.
Bingham Central	1½	1½
Boston Copper	27¼	23⅛
Calumet & Arizona	164	160
Cumberland Ely	10	9
Dolores	8	8¼
El Rayo	5	5
Guanajuato Con	4¼	4⅛
Giroux Con	8¾	8¼
Greene Con	24¼	22⅜
Nevada Con	14¾	13⅝
Nipissing	12⅛	11⅞
Tennessee Copper	31¾	39
Tonopah Ex	3⅞	3½
Tonopah-Belmont	4⅝	4¼
Tonopah	16	16
United Copper	65⅜	58
Utah Copper	30¼	28

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

Mining Summary.

ALASKA.

Some good specimens of ore are coming from the mine at Auk bay, owned by William Winn. A tunnel is being driven on the vein, and the lode is uniform in size.——Some fine bornite ore is being brought from the ridge bordering on the north fork of the Kuskokwin river. The vein is from 18 to 36 in. wide, with the pay-streak from 3 to 15 in. wide, while the gangue is quartz.—— The 20-stamp mill of the Big Hurrah mine, near Solomon, is running steadily.

ARIZONA.

COCHISE COUNTY.

The Bisbee miners have been given a raise in wages, which is the second advance within five months. Without any demand on the part of the miners, a statement was issued by the Copper Queen Con., the Calumet & Arizona, Superior & Pittsburg, Shattuck-Arizona, Denn-Arizona, and American-Saginaw companies that owing to the rise in the price of copper since the scale of wages went into effect on November 7, the following scale would become effective April 1: Miners and earmen, $4 per day; shaftsmen, timbermen, pumpmen, and cagers, $4.50; mule-drivers and firemen, $4; first-motion hoist engineers, $5.50; second-motion hoist engineers and dinky engineers, $5 per day. Sawmill men, timber-framers, blacksmiths and helpers, hand-tool sharpeners, carpenters and helpers, machinists and helpers, boiler-makers and helpers, all get an advance of 25c. per day over the old rate. It is the intention that this scale shall be maintained until there is a material drop in the price of copper. The increase in rates is also to be shared by the men connected with the smelters of the Copper Queen and Calumet & Arizona companies, at Douglas. Considering everything, Bisbee is one of the best mining camps in America, as the mines are large producers, wages are good, and the workmen are surrounded by desirable conditions and means of intellectual improvement and healthful recreation.

This recalls the various prices paid to labor since mining began in Bisbee. In 1885, the wages were $3.50 per day. In 1887 copper dropped to 8c. per lb. and the miners agreed to work for $3, which they did for some time before the wage was placed at $3.50 again. The $3.50 scale continued until 1893, when copper again dropped, and $3 became the pay for a day's work and continued so for about a year, when it was again raised to $3.50. Since 1904 and up to last November, $3.50 was the pay for an eight-hour shift. The eight-hour day was voluntarily given the men in 1902 by the operators and has continued since then.——The tunnel on the Gardner property at Paradise is 130 ft. long, and will be driven 80 ft. further to get under the vertical shaft. The ore carries copper and lead. About 500 ft. of work has been done on the group by the owner, G. I. Gardner.——The Bisbee-Sonora Dev. Co. has absorbed the property of the Paradise Dev. Co., consisting of 10 claims. The new company has also taken over 30 claims in the Warren district, another group of 30 claims in the Paradise district, and other ground, making 70 claims in all.——About 1,700 ft. of work has been done on the Lavery & Hedberg group.

GILA COUNTY.

The Old Dominion mine will, after April 1, pay all miners $4 per day and a proportionate increase for others connected with the mine above ground. The great sulphide strike, a body on the 14th level which has been penetrated to a depth of 73 ft. and yet shows no ending, is occasioning some wonder. The assays run from 22 to 60%. Two crosscuts will soon be run on the 500-ft. level of the Globe Con. Mines Co.'s property.——For a consideration of $285,000, the first payment to be made on May 1, this year, an Eastern syndicate, represented by Sam. W. Osgood, acquired the Collins-Doyle and the Lucky Doyle groups of claims, which are reckoned among the best properties in this district. It is understood that development work will soon begin.

GRAHAM COUNTY.

The Buena Vista group, consisting of seven claims, has been sold to the Arichise Copper Co. for $40,000. This group is situated seven miles north of Solomonville, in the Gila Mtn. A contract to sink a 100-ft. shaft has been let, and ore cars, etc., have been ordered from Los Angeles.

The Chase Creek Copper Co. had made a strike in the long tunnel, which is now in 1,600 ft., giving a depth of 800 ft. About two feet of low-grade ore was cut. I. N. Stevens is the superintendent.——The Comstock shaft of the Gold Belt company is down 100 ft., and will be continued down to the 500-ft. point. Gasoline hoists are used at the Comstock and Gold shafts.

MARICOPA COUNTY.

The Blue Lead mine is shipping ore to the Humboldt smelter and it is said that development work on a large scale will soon commence on this property.

MOHAVE COUNTY.

A party of men from Colorado is engaged in sampling the Bimetal mine, of the Maguire group, south of Kingman. The ore is free-milling gold ore, low in grade, but the deposit is extensive.——The Benedictine company is working a large force of men on the road and in the mines and mill. The Arnold shaft will be sunk.

Map of Arizona.

PIMA COUNTY.

The Keystone copper claims, situated about six miles west of Redington, in the San Pedro valley, have been sold to parties from Butte. Development work will begin immediately, as assessment work has disclosed favorable conditions.

PINAL COUNTY.

D. H. MacKay, acting for Eastern and Los Angeles capitalists, has recently purchased a bond on five claims adjacent to the Silver Queen mine, in the Pioneer mining district in Pinal county. There is great activity in this district at present, owing to the recent rich strike of copper glance in the Queen mine. About ten companies are now at work, their operations covering a radius of about five miles. ——The Mitchell company has recently struck some rich silver ore in a tunnel on its property, which is a mile and a half south of Superior.——The Oregon-Arizona Copper Co. is installing a steam-hoist on its claim half a mile south of the Mitchell property.——The Calumet Con. Copper Co. has 40 claims in this district and is working a good force of men. Men have made a new strike on the south end of the group, having discovered a four-foot vein of copper-glance ore.

CALIFORNIA.

AMADOR COUNTY.

The Bright mine has been pumped out and examined by an engineer with a view to purchase. The result of his sampling has not been made known.——The 2,500-ft. level of the Argonaut is being opened, and promises to be as productive as the 2,400-ft. level, although no ore has been milled from the lower point.——The Wildman company, which has been financially embarrassed for some time, has been forced to stop operations, as the men would work no longer without pay. The top of the shaft has been boarded over and the mine may be permanently abandoned.——The broken compressor at the Keystone has not been repaired, and operations are retarded.

ELDORADO COUNTY.

Engineers are examining the Delevish mine in the Georgetown district, and the property may be re-opened.—— The Pyramid Mining Co., operating in the Shingle Springs district, is advertising for bids for extending the tunnel 500 ft. farther on the vein.——The asbestos deposits in the north end of this county are being examined with a view to using the material in manufacturing enterprises in San Francisco.

KERN COUNTY.

Joseph Weringer of the Greenback Copper mine, near Woody, will commence shipping ore again, after a shutdown of several years, as soon as the roads are in shape for hauling.

The Randsburg district is quite active. The Sunshine mine has been examined with a view to purchase. The shaft is down 410 ft. on this property and the mill and cyanide plant are in good condition, although not running.—— La Crosse mine has been bonded along with a number of other claims, and work has started.——The Alameda mine, just beyond the Johannesburg, will be worked again.

MONO COUNTY.

The long tunnel of the Tanawa Mining Co. will be finished this summer, to a length of 2,800 ft. It has already cut some good veins.——The travertine quarry in this county may be worked again this summer, to furnish ornamental stone for new buildings in San Francisco.——In the Masonic district, the Pittsburg-Liberty company is leasing blocks of ground. A mill will be built in Calavada cañon.

NEVADA COUNTY.

(Special Correspondence).—Attention is again directed to the Washington district on account of a recent strike in the Grey Eagle mine. Free gold has been found in the 14-ft vein, resembling placer nuggets more than gold from a quartz vein. This mine is situated near Maybert, over the ridge from the Arctic mine, which made a strike not long ago.——Some rich specimens have been taken from the 400-ft. tunnel of the Worthley mine, showing free gold and quantities of sulphides. This mine is situated near the Giant King mine, on Washington creek.——Flattering reports are coming from the Truckee district, and miners investigating the district assert that the showing there is good.——A strike has been made in the Lincoln mine, situated about one mile east of Nevada City. The shaft is down 60 ft. The rich ore was encountered at the bottom and along a 25-ft. drift to the east. The ore assays $200 per ton and the vein is two feet wide. The Resartus company, which bonded the mine from the owners, John R. Tyrrell and associates, is developing it and intends erecting a complete plant.——The Canada Hill Consolidated mine is again in operation and sinking from the 1,300-ft. level is in progress. Work had to be suspended the first part of last month on account of the flooding of the mine from a cave from the Greenman mine. The shaft was filled with driftwood and debris, the removal of which was accomplished with difficulty. A two-foot lode of fine ore is displayed in the bottom of the shaft. The corporation consists largely of Berkeley men and they have installed upon the property one of the best plants in the district, consisting of a pump and hoist and a compressor. A 10-stamp mill will be erected during the summer.——The Boss mine, near Sweetland, is to be systematically developed. A plant has been erected that is run by electric power and the company is sinking a shaft, which is down 150 ft. and will go to the 600-ft. level as rapidly as possible.——The Ethel mine in the Washington district is to resume operations in two weeks. This is a thoroughly equipped mine and has a promising future. It has been in operation two years and has extensive underground workings and surface improvements.

Nevada City, March 18.

SHASTA COUNTY.

Grading for the Mammoth Copper Co.'s railroad from Central Spur to the Quartz Hill mine will be completed about April 1. From the Quartz Hill mine to the Southern Pacific siding the road will be narrow gauge and bunkers will be built for storing the ore while effecting the transfer. About 360 men are employed at present in this work.—— The Guggenheims will ship 100 tons of ore per day from the Golinsky mine, on which they hold a bond. Holt & Gregg's narrow-gauge railway will be extended from the limestone quarry to this mine, a distance of two miles, the motive power to be furnished by mules.——The new 10-stamp mill at the Brunswick mine has been started and is working satisfactorily. All machinery at the mine and mill is run by electricity. This mine, which is near French Gulch, was sold two years ago to H. D. Lacey, of New York.

TUOLUMNE COUNTY.

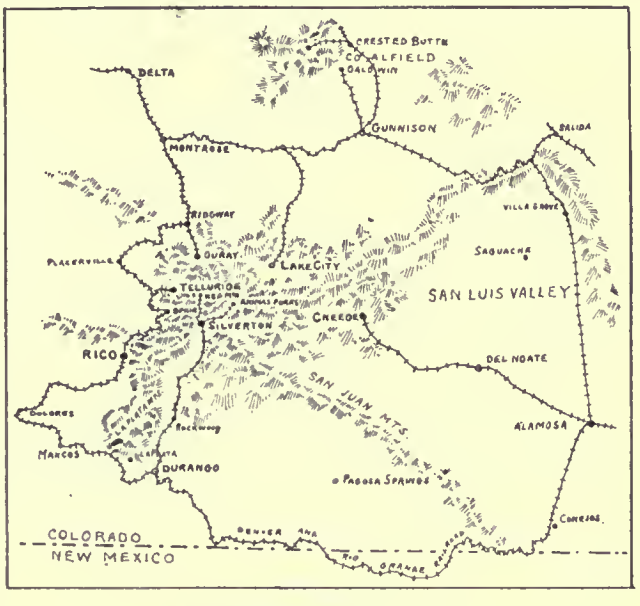
(Special Correspondenee).—Another rich strike has been made in the Soulsby mine, operated by the Bagdad-Chase G. M. Co. A cross-cut from the drift on the 200 level to the hanging wall exposed a body of ore rich in free gold.——It is reported that the Draper M. Co. has been reorganized and that the indebtedness against the Draper mine will be liquidated and operations resumed.——Instructions to resume operations at the Nonpareil mine are daily expected by A. P. Dron, the superintendent.——Development work is going on uninterruptedly at the Preciosa mine, situated eight miles south of Tuolumne, and large bodies of low-grade ore have been opened up. Adit No. 3 is in 200 ft., and cross-cuts show 15 ft. of good ore.——A road two miles long has been built to the Ellen Winton mine, and as soon as the weather permits a stamp-mill and other machinery will be installed on the property.——It is reported that the Bagdad-Chase G. M. Co. proposes to run a cross-cut from the Davidson shaft of the Soulsby mine for the purpose of developing the Wheal Perrin mine, whose vein runs parallel with the Soulsby. Another cross-cut is to be run from a point north of the Pennsylvania shaft to tap the Churchill vein. Many years ago, rich ore was extracted from both the Wheal Perrin and the Churchill, but neither has been worked for a long time, and the old workings have caved in. The proposed cross-cuts will each be about 300 ft. long and will tap the veins several hundred feet below surface. ——The company, composed of Austrian people, which recently bonded the Duffield mine, situated north of Tuolumne, has begun development work with a crew of six men.——The Tennessee Pards G. M. Co. will shortly begin operations at the Esmeralda mine, near Groveland, and Harry Holden will be superintendent. The shaft will be retimbered and development work will then follow.——At the Harvard, 10 more stamps will soon be set in motion, making 40 in all. The winze being sunk from the 800-ft. level is down 115 ft., from which point a drift has been started on the vein. Stoping is in progress on the 500 level, and the extraction of ore from the 700, north and south, will soon be commenced. Seventy-five men are employed.—— An air-compressor has been installed at the Experimental Gulch mine, owned by Conlin Bros., of Columbia, and machine-drills will be used in the cross-cut being driven to tap the vein. The cross-cut will be 1,000 ft. long, and from the point where it taps the vein a drift will be run an additional 1,000 ft. to reach the main shoot, when the face of the adit will be in line with the shaft and 550 ft. below surface. ——The Springfield Deep Gravel mine, the property of the Springfield Tunnel & Dev. Co., will be unwatered at an early date, preparatory to active operations. J. M. Buthenuth is superintendent.

Tuolumne, March 24.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—There is an improvement in the block of ground being worked by Riley & Roehrl on the Sunburst. The orebody has gained in size during the past two weeks from 18 in. to three feet, with assay values increasing from 80 to 175 oz. silver per ton. From 10 to 15 tons are broken daily, and heavy shipments are in order. These lessees are making arrangements to resume work in the winze directly under the stope, and in view of the fact that a 16-in. streak of 600-oz. ore was left in the bottom, previous to the suspension of work, important discoveries should be made in opening the ground by a drift.——Work is being crowded on the Ramsdell mill, and the machinery should be ready inside of 60 days. This plant is to be a modern one. The specifications call for the setting of the crusher, tables, and jigs in cement. In addition, all the floors will be of cement. Hendrle & Bolthoff secured the contract, the price being $22,000.——The Lincoln cross-cut has been advanced 750 ft. and according to surveys the Virginia City vein will be reached within 400 ft. Great results are expected with the cutting of this lode, as from the shaft a heavy production resulted a number of years ago.——Workmen are laying the pipe-line for the 50-ton mill to be erected by the Linn Consolidated M. Co., operating the Mineral Chief on Republican Mtn. According to report, construction of the plant will be started within 30 days. The 10-ton concentrator situated below the portal of the Moline tunnel is running on full time and enough of the finished lead and zinc product is being turned out to insure the payment monthly of one per cent in dividends on all outstanding stock.——The electric plant of the Two American Sisters M. Co. has been started and as a result the 50-ton concentrating plant at the mine is being operated on full time. Wires are being strung throughout the Columbian Mtn. section and power is to be supplied to a number of operators, contracts having already been signed. J. J. White, the resident manager, expects to be employing a force of 40 men within 30 days.——The strike made in the Prince Albert, situated on Columbian Mtn., is improving. The discovery was made in a shaft sunk to a depth of 32 ft., a body of $400-ore having been uncovered. The streak measures two feet in width, and for a distance of 45 ft. the ore-shoot has been found to be continuous. The old workings are being cleaned out and re-timbered, and shipments of about 30 tons per week are being maintained.——Lawson & Co., leasing in the Millington, have encountered a 14-in. streak of $125 silver-lead ore and shipments began this week.—The Dictator continues to ship high-grade ore. A rich streak is being followed and returns in some instances are received in settlement at the rate of 2,200 oz. silver per ton.——Chas. Carlson, lessee of the Lucky Hesperus on Democrat Mtn., is making ready to start shipments. This operator has a streak of ore four inches wide, which mills on an average, 350 oz. silver per ton. A body of quartz is being followed which is worth $40 per ton.——The Krupp M. Co., operating on the Friar Tuck and Bellmont lodes on Saxon Mtn. is working on development. Good headway is being made in driving the adit, and the junction of the two lodes will be reached within 60 days. F. N. Tucker is the manager.——Carson & Swanton, operating a group of claims in East Argentine, have completed the year's assessment work, and a number of important discoveries have been made. Ore is showing in a number of places and now that work is to be resumed on the cross-cut, the holdings should shortly be on the list of producers. These claims are close to the Vidler tunnel property.——Report has it that the Lebanon group of 39 claims, is about to pass to a syndicate of New York capitalists, the consideration being $80,000. In the event of the deal being finally consummated, a milling plant with a capacity of 100 tons will be erected. W. H. Maxton of Georgetown is in charge of operations.——Heavy shipments are being made from the Silver Cloud on Sherman Mtn. A body of smelting-ore is showing in the stope which measures two feet in width, returns of 71% lead and 35 oz. silver per ton being received in settlement.——Shipments are in order from the Mammoth on Brown Mtn. A big body of lead-zinc ore is being followed, the product being shipped to the Kaverne mill at Dumont, where the two metals are separated.——F. A. Maxwell, lessee of the Colorado Central, is making arrangements for shipping several hundred tons of lead-zinc ore to the mills at Idaho Springs. The first lot of 150 tons will go out next week. If the expected saving is made, the output from this property will be increased during the year. The ore is taken from the Sleepy drift, run from the Equator adit, and one of the largest bodies of medium-grade ore in the history of the mine is being stoped, measuring from five to seven feet in width.——Work was resumed this week upon the Clyde group of claims on Leavenworth Mtn. The tunnel is in 500 ft., and is being cleaned out and re-timbered, after which the bore is to be driven to intersect the veins lying ahead. H. K. Miller of Georgetown is the owner.——A lode was intersected on the Annie May cross-cut this week at a distance of 100 ft. from the portal. Two feet of mineralized quartz is showing, through which are running a number of feeders of high-grade ore. E. E. Grubb, the manager, states that a compressor-plant will be installed.——Driving on the Magenta-Turner lode intersected through the Prudential adit, is bringing forth good results. A streak



Map of Southwestern Colorado.

of fair-grade ore was encountered a few days ago which measures eight inches across. Assay-tests show the stuff to be worth $52 per ton in silver and lead. J. J. White is the resident manager.——Work will be resumed in a few days upon the Scott property situated on Republican Mtn. There is at the present time exposed an 18-in. streak of lead ore which is worth $63 per ton. As soon as the ground has been opened for another 100 ft., stoping will be started. John White of Georgetown is the manager.——The Douglass on Douglass Mtn. is shipping a good tonnage of fair-grade ore. The material goes to the mills at Idaho Springs for treatment. The returns show 40% lead, 34% zinc, and 19 oz. silver per ton. L. G. Shepard, the manager, states that the property will be equipped with a 25-ton concentrating plant.

Georgetown, March 22.

DOLORES COUNTY.

At a depth of 185 ft., in the Atlantic Cable mine of the United Rico Mines Co., the porphyry gave way to quartzite, and these is every indication that a new vein will be struck. Rich seams of copper-sulphide ore, of a character never before found in Rico, have been encountered. There is a good deal of trouble from gas in the lower level, and a blower has been installed.——At the Enterprise group, the work, under Murray Lee, is largely of a reclamative nature, old drifts and workings being cleaned out and re-timbered.

LAKE COUNTY.

(Special Correspondence).—The Midland Mining Co., for which F. J. McNair, is the manager, is operating the Hellena Black Cloud and Jane-Eugene lodes in Iowa gulch and shipping one car per week which runs $25 to $45 per

ton. The shaft on the Hellena is now 600 ft. deep and will be sunk 200 ft. deeper later on. At the 650-ft. level they estimate they will strike the contact and will probably encounter water at that depth, necessitating more machinery. Sinking is in what is known as the Weston fault. The company is composed mostly of Pittsburg men.——Activity is being shown in California gulch, more particularly at the Yak tunnel. Four 420-h.p., Stirling Water Tube boilers are being installed at the Yak power-house by the Leadville Light & Power Co.; also electrical apparatus. This company is closely allied to the Yak company.——The A. Y. & Minnie mill is handling the usual amount of material. The Iron Silver is also doing the regular amount of work.

Leadville, March 18.

OURAY COUNTY.

Shipments of rich ore continue from the lease belonging to C. A. Scoope, on the Jonathan property, within the city limits of Ouray. The last carload ran about $20,000.——The Chipeta tunnel is now past the 1,900-ft. mark. At this point the big fracture-zone was encountered and the ground had to be heavily timbered. A raise will now be run to connect with the O. & N. tunnel, a distance of 150 feet.

IDAHO.

BOISE COUNTY.

The Idaho Eastern Railroad is now under construction through the Boise mineral basin to Centerville. As an instance of the impetus that has been given to the development of the district, it is stated that at the McKinley mine, on Jupiter Mtn., a working tunnel will be started to cut the veins at a depth of 1,500 ft. This property has already been opened by prospect-tunnels and open-cuts, and good ore has been removed from depths of 50 or 60 ft. The new railroad will pass within half a mile of the McKinley mine.

IDAHO COUNTY.

It is believed that F. W. Bradley, and associates, who hold a bond on the Buster mine, near Elk City, will purchase the property. The shaft is down 100 ft., and cross-cutting has started from the bottom. J. R. Hutcheson and sons have taken a contract to run a 250-ft. tunnel on the Twin Butte property, near Orogrande, and about 75 ft. has been completed.

NEVADA.

WHITE PINE COUNTY.

A report comes from Boston that the Guggenheim engineers are examining the Giroux property at Ely, with a view to taking control.——It is estimated that over $14,000,000 has been spent by the Cumberland-Ely and Nevada Consolidated Copper companies, in the purchase of properties, development of mines, construction of the Nevada Northern railroad, and the erection of the reduction plant of the Steptoe Valley company. When the reduction plant is completed, the total expenditure of the two companies will have exceeded $20,000,000 which is a pretty large first-cost, before any revenue is derived. The concentrator, to handle 5,000 tons, and the smelter with a daily capacity of 1,500 tons, will be in operation by January, 1908. The largest orebodies thus far opened in the district are in the Ruth and Eureka workings of the Nevada Consolidated, and the best high-grade ore is in the Veteran mine of the Cumberland-Ely group. At the 360-ft. level in the latter mine is a large body of ore averaging from three to six per cent copper.——The raise at the Ely Witch, from the tunnel to the surface, has been completed, having a total length of 260 ft. This will be used as the main shaft in the future.——A new shaft has been started by the Butte & Ely Copper Co., east of the present shaft on the Beehive claim.——About 20 men are employed at the Ely Central property. Two Keystone drills are at work, one being down 325 ft. S. F. Hunt is the superintendent.——Electric lights are being hung at the Steptoe smelter, to enable the steam-shovels, engaged in excavating for the foundations, to work night and day.

NEW MEXICO.

TAOS COUNTY.

The Philadelphia group of four claims was recently sold to a Milwaukee syndicate. B. F. Baker is the manager. The same company purchased the Copper George group of 15 claims adjoining this ground.——The Humboldt shaft, of the Hermosa company, is down 500 ft. From the shaft, a cross-cut is being driven northwest to prospect the granite between the Tourmaline and Honeycomb veins and the Humboldt contact. It is intended to sink to 1,000 ft., and the mine is well equipped with machinery for working at this depth.

MEXICO.

CHIHUAHUA.

Zinc shipments will be started from the station of Baca, being the first ore shipped from the properties of the Almoloya company since the old shipping contract expired in February. The new contract is a good one, and the 10,000 tons now stored at the station will be loaded at once.——Two good strikes have been reported from the Santa Eulalia camp. One was in the Reina de Plata mine, owned by A. McKenzie, and was made at a depth of 340 ft. It is estimated that 50,000 tons of ore are developed, running from 40 to 200 oz. silver per ton. The other strike was made at the 850-ft. level of the Buena Tierra mine of the Santa Eulalia Exploration Co.——Shortage of coal prevents the starting of the new pumps in the Americana mine at Terrazas camp.

NUEVA LEON.

The manager of the German interests owning the Mexican Metals Co., the Peñoles M. & S. Co., and kindred interests in Mexico, has purchased for his companies the Minas Viejas property, near Villaldama, together with the railroad leading from the mines to a point on the National railroad. The new company will take possession immediately, and it looks as though it intends to extend its operations over a larger field than ever before. The property produces zinc ore. F. F. Salisbury is the manager.

SONORA.

Ore has been struck in the lower limestone tunnel of the Sierra de Cobre property at Cananea. The strike was made at the 175-ft. point, and the ore is similar to that in the upper limestone tunnel. Connection will shortly be made between the two tunnels. In the main shaft, the 750-ft. point has been passed and work is continuing toward the 800-ft. point. The property is looking well.——At San Javier, the Wyman Mining Co. is sinking a shaft on the Animas mine. The Ohio-Mexican company is doing development work, with satisfactory results.——It is reported that 50,000 tons of rich silver ore has been developed, ready for stoping, at the Belen property, in the Arizpe district, out of Hermosillo.——The Buena Vista company has cut the vein at a depth of 300 ft.——The Congress mine, west of Carbo, which was sold by L. W. Cowan to an English syndicate, is looking well. The adjoining property, the Rosalia, is also being worked.

Four veins have been discovered on the claims of the International Copper M. Co., in the Carnero Mtn., 30 miles west from Carbo.——At Fundicion, the present terminus of the Alamos extension of the Cananea, Rio Yaqui & Pacific Railway, the Pacific Smelting & Refining Co. is erecting a 1,000-ton reduction plant, to reduce the ores of the Douglas Copper Co., which has properties at El Cobre, in the Bayoreca region; and of the Sonora Con. M. Co., operating the Trigo mines, in the Quiriego region. A narrow-gauge railway is to be built to connect the mines with the reduction plant, which latter will also treat custom ore.——The U. S. A. Mines Syndicate, which owns and operates the Constitucion and Italia mines in the Tortuga region, 25 miles east of Hermosillo, has a carload of mining machinery coming from Denver. The mill will be started May 1, with four Huntington mills in operation. The same corporation has ordered a cyanide plant for the Yeso camp, where another property will be operated under the same management.

It is stated that another 100-ton stack will be built at the Promontorio mines, below Moctezuma. This company has only been producing for about a year, since Illinois capitalists took hold of it. The ore bears copper and silver, and some high-grade ore has been shipped to Douglas and El Paso, but the majority is so low in grade that it was decided to smelt it on the ground.

Special Correspondence.

London.

Mining in Cornwall.—No Increase in Production of Tin.—The Future of Dolcoath.—Persistence of Tin Ore in Depth.—Use of Hammer-Drills.—Scarcity of Labor.—New Flotations.—The Zinc Corporation.—Drop in the Shares.—The Reason for It.—Annual Report of the Mysore.—Progress at the Dolores.

While stockholders in the two or three dividend-paying mines in Cornwall are feeling pleased with themselves over the continued high price of tin, onlookers are wondering why advantage is not taken of the exceptionally favorable circumstances to create larger ore reserves by more extensive development. It is pointed out that while Cornish black tin received the record price of £117 4s. 10d. per ton at the last ticketing, the quantities sold by five of the leading mines, namely, Dolcoath, Carn Brea & Tincroft, Grenville, Levant, and South Crofty, in January and February of this year showed a decrease in each case as compared with the corresponding period of 1906. The reason given for the decreased output of Dolcoath is a slight decrease in the produce of tin per ton of stuff treated, and is expected to be only temporary. The saving point is that Dolcoath has made £3,000 more from a smaller quantity of tin. But Carn Brea is not only lower in output, but also in money value. Basset makes a capital advance, being 14¼ tons to the good and £3,307 in money. Grenville, like Carn Brea, shows a serious decline, being no less than 35½ tons short of the quantity sold in the first four sales of 1906, with £2,015 less. The disastrous series of breakages accounts for a good deal. East Pool has sold nine tons more and realized an additional £2,265. West Kitty has jumped up five tons and placed an additional £1,270 to its credit. Levant, owing to labor difficulty, has fallen off nine tons and has £447 less in cash. At South Crofty the tin has been raised, but the magnetic separator broke down soon after its installation and the management kept back a good proportion of the stuff until it had been readjusted; in fact no tin was sent to the ticketing on February 11. Clitters, like West Kitty, adds five tons and receives £899 more in cash.

In the light of these particulars the manager's remarks at the Dolcoath meeting last week are of general interest. He thought that the proof of the persistence of tin ore in depth might be considered as demonstrated by the extent and richness of the recent discovery in the bottom workings, which were half a mile deep. Referring to the eastern portion of the mine, the manager (Mr. R. Arthur Thomas) said such a large output necessitates ground being opened up to keep the reserves proportionate to the output, and without detailing the various development works in hand, he remarked that on the whole the position in this respect is more assured than it has been for some years past. This portion of the mine is the greatest contributor both in the returns of tin and tin-stuff, while the produce for tin is lower than that of the bottom of the mine. Various developments are in hand, and it is difficult to determine the most important. The most interesting, however, is the work that is being done in opening up the large mass of granite lying between the two lodes to the west of the eastern shaft at the 375-fm. level, and its importance lies in the fact that large profits are expected therefrom. This formation might be described as a brecciated granite with numerous fissures filled with the tin oxide. A large tonnage will be rendered available for working when the developments now in hand are more forward; in all probability at least from 50,000 to 60,000 tons of ore at about 35 lb. tin per ton of stuff. The winze below the 375-fm. level west of the eastern shaft is now down about 10 fm. and a raise over the 400 a little to the west of it have both improved in value and are now producing 60 lb. tin per ton of stuff. Dealing with the question of the working costs per ton Mr. Thomas explained that these have increased consequent upon the higher prices of materials and the increased labor charges, which are higher now than they have been for some time past. A great deal of renovation work has been done at the surface, which is charged to profit and loss account, and in consequence no diminution in the charges can be expected, but a decrease in the cost, especially of dressing, will shortly be secured. The prospect for a reduction in the underground working charges under the conditions obtaining are rather remote, and the manager considers that a solution will lie in the direction of the employment of more mechanical means. Experiments have been made with a hammer-drill, which is virtually the ordinary pneumatic tool, and the results are so satisfactory that their employment is likely, especially if unskilled labor can be employed. There is even now a dearth of skilled miners, and if, as appears the case, the development of the tin mines generally throughout the County are taken seriously in hand, that question is one to be faced; and it would appear that the solution may lie in the direction indicated. Mr. Thomas gave the meeting some particulars as to what was proposed with regard to the utilization of the copper ores left in the upper levels of the mine formerly, when they had no means for the treatment of such complex material. He said the ore they had in view chiefly consists of zinc, copper, and arsenic sulphides in combination with the oxide of tin. The Elmore process extracts the sulphides from the oxides. The oxide of tin is treated in the ordinary method of tin dressing. The sulphides consist of zinc to the extent possibly of 35%, and copper to, say, 4 to 5%. The treatment of this ore presents an interesting problem.

The Cornish labor question will have to be solved in some way if the existing mines mean to make more energetic efforts to benefit by the present opportunity. It is thought that Cornishmen might be brought back from the north of England and south of Wales, while there is talk of importing Italians or Scandinavians, who are excellent workers. The importation of Chinamen is no doubt barred; but the same objections will not apply to 'Dagoes.' This is very well so far as it goes, but the difficulty is in recruiting the old tributer class of miner so essential to the finding and profitable working of tin-bearing ground. The supply of such skilled miners is a matter of first importance to the financial groups responsible for the various new flotations. During the past year it is said 30 Cornish companies were formed with an aggregate capital of £1,184,700 nominal. Among the further flotations in the new year is the Falmouth Consolidated Mines, formed to acquire the Wheal Jane group of mines. Worked in the past in an erratic manner, these properties are said to have paid substantial dividends for many years on the capital employed in them, but with up-to-date plant and under one control greatly improved results are expected. Of the nominal capital of £150,000, £70,000 is set apart for working capital and the general purposes of the company. The Tresavean mine in the Gwennap district, has also been started by a company registered in Glasgow, with a capital of £40,000. When Tresavean was last worked in August, 1885, the output of tin was small. Tin was then £97 against £87 the previous year, 1884. When the mine was at her climax as a copper mine, tin was only £85, so with the present price of metal, Tresavean should be successful. The mine is exceptionally dry and electric power will now

be requisitioned. New Wheal Eliza Consols (St. Austell district) has also been registered, with a capital of £60,000, the promoters being Cornish Tin Properties Ltd. Several of the leading members of Cornish Consols and the Syndicate now owning the Tehidy mineral rights have joined in forming the Cornish Trust. The capital, £100,000, is to be employed in doing mining business generally, and the organization should prove to be an important factor in the development of the mineral resources of the Connty.

It is reported on the market that the anxiety among the shareholders of the Zinc Corporation has not been allayed by the news recently circulated. The proprietors, who have seen their shares as high as 55s., can only now realize at about 28s. They are unable to account for the large amount of selling that has taken place, except on the assumption that there is truth in the rumor that the new plant is a failure. Readers of my correspondence will remember that the Zinc Corporation was formed toward the close of 1905 with a capital of 350,000 shares of £1 each. There were strong local and London boards, the general managers being Bewick, Moreing & Co. The Corporation purchased, approximately, 2,000,000 tons of tailing, containing an estimated value of £10,000,000. For 12 years the Barrier tailings had baffled the metallurgists of the world. Experiments had been tried everywhere without satisfactory results. The Ashcroft process was used at first. Under the old system the Barrier companies were content to save 35 to 40% of the silver, and 56 to 75% of the lead, the zinc passing away with the residue. The Zinc Corporation is understood to be trying the Potter-Carmichael-Bradford process to start with, and to have acquired a large interest in the Potter Sulphide Treatment Co. Mr. Queneau, who was announced as a metallurgical chemist of high attainments and of great experience in the treatment of such ores in the United States, has been removed from the control. The official version of the matter appears to be that this gentleman's services have been invaluable to the company. He is, however, a man who, if anything, aims too high. When he has got his plant and works into such a state that they will give him a 96% return, he would be tempted to undertake their entire reconstruction from floor to roof, if by so doing he could get 97%. This kind of thing, while it appeals to a scientist with considerable force, does not influence in the same way the people that have invested their money, and who are waiting for returns upon it. It has therefore been thought desirable that Mr. Queneau's position should be modified, in order that less of the ideal and more of the real may be infused into the company's program. The change involves no reflection upon Mr. Queneau. In fact, it is rather a tribute to his scientific abitity, which is of a higher standard than the needs of the company require.

The report of the Mysore Gold Mining Co. for 1906, just issued, states that 185,900 tons of quartz were passed through the mills for a yield by amalgamation of 184,163 oz. bar gold, an average of 19 dwt. 19 gr. per ton. In the cyanide department 158,848 tons of tailing were treated, from which 21,755 oz. gold were extracted, an average of 2 dwt. 18 gr. per ton. By amalgamation and cyanidation, together, 208,188 oz. of bar, or 205,918 oz. standard gold were obtained; this realized £809,412, or, after deducting £40,111 paid to the Mysore Government as royalty, a net sum of £769,301. Rents, interest, transfer fees, and rebates on freight increased the income to £775,024. The expenditure chargeable against revenue was £318,924, leaving a profit of £456,100. The three dividends for the year equal 14s. per share, or 140% upon the issued capital, and aggregate £418,674. The authorized capital is now £305,000, in 10s. shares. The underground developments have exceeded in extent, importance, and value those recorded within any similar period in the history of the mine. At Ribblesdale's the workings have now reached a depth of 3,504 ft., and throughout the twelve months the vein at the deepest levels continued wide and rich. The superintendent says: "The developments during 1906 in the bottom of Ribblesdale's have disclosed ore of very good quality, and, seeing that these are the deepest workings on the mine, the outlook in depth on this section is of a very reassuring nature." Referring to the ore-shoot south of Tennant's shaft, the superintendent says: "The new ore-shoot discovered beyond the main shoot in the 1,870-ft. level south of Tennant's shaft, mentioned in last year's report, has opened up exceedingly well, and proved to be continuous at that level for over 400 ft. It still holds forward in the above drift, and has been driven on at

Eastern Australia.

the 1,750, 2,000, 2,120, and 2,240 ft. levels south, and there is every indication that it will not only continue in deeper levels, but will be found to extend to higher ones. As this shoot is uniformly of high grade, it will be seen that a very important and valuable extent of stoping ground has been developed in this part of the mine." A new shaft from surface, named Hancock's, which has reached a depth of 258 ft., is being sunk to facilitate the development of this orebody. Within the past few weeks the vein has entered the shaft, where it is of a promising nature. The deposit is thus proved to exist, both vertically and laterally, to the full extent of the present operations upon it; that is to say, from 250 ft. from surface to the 2,240-ft. level, and for 400 ft. in length. Taken in conjunction with Tennant's main shoot (which maintains its productiveness), this new orebody renders Tennant's section of the property a mine of considerable magnitude in itself.

With regard to the discovery at McTaggart's, the superintendent writes: "In McTaggart's section, where hitherto exploratory work has been attended with little success, a rich body of ore has recently been discovered

south of the shaft, and has been proved for a considerable distance in the two bottom levels, namely, the 1,960 and 2,060-ft. levels, which are farther west than any others previously driven at this end of the property. As to ore reserves, at December 31, 1905, the estimated quantity of payable ore in the mine was 613,000 tons; this has since been increased, after allowing for the 185,900 tons extracted, by 134,000 tons, making at December 31, 1906, 747,000 tons described by the superintendent as profitable. Although the opening up of the mine was temporarily interfered with during the drought, 29,890 ft. of driving, sinking, and rising—being slightly in excess of 1905—were accomplished. The directors are of the opinion that, notwithstanding the past year was one of unparalleled success in connection with the mining developments, there is every reason to anticipate that the current year will be equally satisfactory. The reserves show a substantial increase over those of 1905, and it may be assumed that they will be materially added to during the current twelve months by reason of the discovery at McTaggart's, and in view also of the continued richness of the ore-shoots at Tennant's and Ribblesdale's. About a fortnight ago the news was cabled to London from the mine that Rowse's shaft from the 400-ft. level to surface had been destroyed by fire with head-frames and portions of floors. It is now reported that the fire is extinguished.

Dolores (Mexico) developments continue to prosper. According to the latest cabled news, at the fourth (bottom) level, in the shoot extending from the main workings on the third level, a rich body of ore two feet wide has been struck, assaying $367 per ton, and the rich streak in the vein recently discovered by the San Francisco cross-cut, 330 ft. east of the main workings, has increased to a width of one foot, assaying $438 per ton. The next event awaited is the cutting of the San Francisco vein itself.

Butte, Montana.

Davis-Daly Estates.—Progress of Development.—Important Discoveries in Several Mines.—Green Campbell Co.—Heinze and His Partner.—Dividend From the Snowstorm.—The Iron Mountain Mine.—Troubles of the Raven.—Original Finds Ore on Lower Level.—East Butte Production.

The Davis-Daly Estates Co. is doing a lot of development work on its properties. The long cross-cut going south from the 1,800-ft. station of the Original mine is now 1,500 ft. long. Several veins of good ore have been cut, but they do not apex in Davis-Daly ground. Recently another stringer was cut and it was generally believed that the cross-cut was penetrating the Thomas lode, but the manager says that it will not be reached for a further distance of 100 to 150 ft. The end of the cross-cut is now under Park St., the principal business street of Butte. At the Smokehouse, driving on the vein at the 500 level continues westward and it is expected that good ore will be found within 100 ft. Eastward the drift has encountered a broken and displaced condition of country and some exploration work will be necessary there. Operations at the Smokehouse are expensive, every pound of waste must be hauled away as fast as hoisted out of the mine, which is situated on a small lot in the heart of the business district of Butte. The shaft of the Colorado is down 750 ft. and will be sent to a depth of 1,000. Cross-cutting is also being done at the 500, but the opening is in country-rock. Sinking has been resumed at the Silver King, where the shaft has been straightened and skips put in. At the Mt. Moriah cross-cutting to the vein is in progress. In the west drift of the Smokehouse stringers of copper glance have been found and Mr. Palmer, the manager, is confident that commercial ore will soon be found in that property.

It is reported that the Butte Coalition Co. has cut a big vein in the ground of the Alice Co., north of the Corra mine. At a depth of 2,200 ft. the Coalition ran a cross-cut from the Corra northward. The vein cut is believed to be in the Magna Charta claim; the value of it is not known, but the information is that it is a good one.

It is reported that the North Butte Co. has decided to sink a new shaft on the Berlin claim, and that it will be used as a second working shaft, the one on the Speculator not being of sufficient capacity to mine all the property of the North Butte. This decision was made after the vein in the Berlin was cut by the 1,600 ft. cross-cut from the Jessie mine. At a depth of 1,800 ft. the vein of the Edith May has also been opened. The North Butte Co. has just purchased the Gem millsite, a small claim lying in Silver Bow creek, south of the Margaretha of the Berlin group, paying $50,000 therefor.

The Green Campbell Gold Mining Co., which has stockholders both in the East and West, has suspended operations at its mines in the Silver Star district of Madison county. The company owns a number of claims and several mines from which, many years ago, a great deal of gold was taken. What remains and has been opened comprises several large bodies of low-grade ore, yielding

Montana.

from $2 to $14 per ton, the average being low. A lot of money has been spent developing the property, and about a year ago it was decided to build a concentrating and amalgamating mill, which was recently completed. The company built a good mill but neglected to figure on a water supply, depending on the water taken from the mines. That, however, proved insufficient and instead of treating 100 tons of ore daily, as the company has expected to do with the new mill, it could only take care of about 20 tons. After a short run, it was also discovered that the mill was imperfect, and a shut-down became necessary. Before work can be resumed a water supply must be obtained, and that will cost considerable money, as it must be brought a long way and by means of a pumping plant. Additional machinery for the mill is necessary, and the company is deeply in debt, having a bonded indebtedness of $75,000 and unsecured debts of more than $25,000. The nominal capital is $1,000,000. A reorganization will be necessary.

F. Augustus Heinze and his former banking and business associate, Thomas M. Hodgens, are giving promise of airing a lot of trouble in the courts, and the friends of each predict sensations. Hodgens has already instituted two actions in the courts of Montana and two in New

York. The Montana suits are for an accounting of a stock investment business. One of the suits instituted in New York is for an accounting of a Long Island real estate deal, in which they paid $150,000 for 966 acres of land, now claimed to be worth $1,000,000. The other suit is against the United Copper Co. for an accounting. Hodgens owns 1,300 shares of preferred stock and he charges that during the past year the company has paid a total of $3,450,000 in dividends when as a fact, as he claims, it did not earn to exceed $1,000,000 net. He therefore demands an investigation to ascertain the standing of the company and the source from whence came the surplus put into the dividends.

The Snowstorm Mining Co. has declared another monthly dividend of 3%, which calls for a distribution of $45,000 to the holders of the stock. Equal sums were distributed in dividends in November, February, and March, making a total of $135,000 to date. The manager, W. D. Greenough, has been in New York for several weeks and that fact has given rise again to reports that the Greenoughs may sell their interests in the Snowstorm to Heinze. It is a fact that Mr. Heinze tried to buy the Snowstorm, but they could not agree on a price. The Lewisohns also made an offer for the property. It is also reported that the Greenoughs have secured absolute control of the stock of the old Iron Mountain Mining Co., whose property lies just east of the Cœur d'Alene and north of De Borgia, Mont. At one time the Iron Mountain was a more famous producer of silver and lead than the Bunker Hill & Sullivan, but for more than eight years no work was done. The old workings consist of one shaft 1,800 ft. deep, and some drifts and cross-cuts. When a law was passed requiring more than one exit to a mine, work was stopped on the Iron Mountain. The ore-body, though rich, is but 350 ft. long, and, the ore having been taken out to so a great depth as 1,800 ft., the owners were in doubt if enough ore could be mined to pay for the driving of an adit that would tap the ore-shoot at a greater depth. Last spring, however, work was started on a long opening which will be driven more than 10,000 ft., and is being pushed ahead at the rate of 10 ft. per day. It will require at least three years to complete the adit.

So far as Butte stockholders and officers of the Raven Co. are concerned, there is little knowledge of what progress is being made toward a reorganization of the company. They claim to be in entire ignorance as to what, if anything, is going on. The hope of the Raven people is that the Amalgamated and Coalition interests may be induced to put their holdings into the company, but, as far as can be learned in Butte, no progress has been made in that direction.——It is reported that the Colusa-Leonard Extension Co. has cut a small vein at a depth of 185 ft. in the shaft, but it carries little value. The vein is about three feet wide and was in the shaft a distance of 50 ft. before it passed out to the south. The Colusa-Leonard made a record in shaft-sinking. Work was started about the first of December and a station is now being cut at the 500-ft. point. When the station is completed sinking will be resumed and the shaft will be put to a depth of 1,000 ft. The Colusa-Leonard lies just east of the property of the Reins Copper Co. The Colusa and Leonard mines are east of the Reins.

The Original Mining Co. has opened some better ore on the lower levels of the Stewart and Original mines and the output has been considerably increased. Nearly a thousand tons of ore are shipped daily to the Butte Reduction works. It is estimated that the March production of copper by the Clark works will be between 1,300,000 and 1,400,000 lb., including the custom ore treated there.——The East Butte Mining Co. has started a cross-cut south from No. 11 shaft and will open the Yankee Boy vein at a depth of 400 ft., probably within a week. The north cross-cut from the same point is being pushed north and will shortly connect with the cross-cut from No. 1 shaft. The latter shaft is now 800 ft. deep, and another station will be cut there. During the past week this company made two shipments of precipitate, which yielded about $14,000 in smelter returns.

Calumet, Michigan.

Approach of Spring.—New Exploratory Work.—Tracing the Baltic Lode.—Activity in Keweenaw County.—Calumet & Hecla Testing Large Tracts.—The Keweenaw Co.—The Medora Amygdaloid.—Diamond-Drilling on the Empire Tract.—The Centennial Equipment.

Present indications are that the spring in the Lake Superior copper country will come in three or four weeks. There are already signs of a break-up, but the snow will not be sufficiently melted to permit of exploratory work for a few weeks. The high price of copper for the past year has placed the mining companies in an excellent position to do an exceptionally large amount of exploratory work and unusual activity along this line is expected.

In Ontonagon county, at the southwestern end of the Michigan copper region, it is expected that there will be considerable work. The Lake Copper Co., which now owns and operates the old Belt property, has found by means of diamond-drill explorations what is believed to be the Baltic amygdaloid bed. A shaft will be started as soon as the ground is in good condition. The top of the lode is near the surface, and, as the overburden is light, no trouble is anticipated in getting the shaft down to the solid rock. There are a number of companies in the vicinity of the Belt mine that may explore for the Baltic lode. The Mass Consolidated Mining Co.'s property is well located and it is believed that the lode exists on its land. The Mass management has also signified its intention of exploring for this lode during the spring. The Adventure property probably contains the dip of the Baltic lode, but the formation could be opened only by means of vertical or very sharply inclined shafts. The St. Mary's Mineral Land Co. owns land adjoining the Lake Co.'s property and the tract undoubtedly carries the continuation of the lode.

In Keweenaw county, which is at the other end of the copper region, the coming summer is expected to witness a great deal of activity. Near the Houghton county line the Allouez and Ahmeek mines are developing into valuable properties, and adjoining the latter on the north is the Mohawk, the most important producer in that vicinity. But beyond the Mohawk, the work which is now in progress, and is contemplated, is largely exploratory in character. The Calumet & Hecla Mining Co. and the Keweenaw Copper Co. are the most important concerns operating in that district. The Calumet & Hecla is working through subsidiary companies, which are developing and exploring a big territory. Immediately north of the Mohawk is the Gratiot, controlled by the Calumet & Hecla. This property, like the Mohawk, is being developed on the Kearsarge amygdaloid. Two shafts are being sunk, but the work has not reached sufficient depth as yet to give an adequate idea of the lode. The Ojibway is developing lands north of the Gratiot; it is a new company, in which the Cole-Hoatson-Ryan people are interested, being largely the same group as that which controls the Keweenaw Copper Co. The Ojibway property was explored with a diamond-drill under the direction of Dr. L. L. Hubbard, of Houghton, former State Geologist and at present

general manager of the St. Mary's Mineral Land Co.'s Challenge, King Philip, and Winona mines. At Delaware, the Calumet & Hecla is working two shafts on the Montreal River lode, an amygdaloid that gave much promise at surface, but the showing in the lowest openings is not so favorable. Another shaft was started not long ago on what is believed to be the northerly extension of the Kearsarge amygdaloid. The showing in this is encouraging.

The Keweenaw Copper Co.'s principal work is at the Mandan location, where a shaft is being opened on the Medora amygdaloid. The representative of the MINING AND SCIENTIFIC PRESS was underground in the mine this week and carefully examined all the openings. The showing is most encouraging. The Medora lode is crossed at some points by fissure veins, and at the points of intersection is greatly enriched. The shaft has reached a depth of 500 ft. and the rock in the bottom is uniformly well charged with copper. There is considerable 'mass' and 'barrel work' at the shaft that was

At the Centennial mine the new steel shaft and rock-house at No. 2 shaft is enclosed, and work on the interior is progressing rapidly. The power-equipment for No. 2 shaft, consisting of a hoisting-engine and high-duty air-compressor, supplementing the power-equipment in service at No. 1 shaft, is well advanced, and will be ready for operation by the time the rock-house is completed.

Goldfield, Nevada.

The Labor Trouble.— A Fight Between Two Organizations.—Mining Operations Hindered.— Scarcity of Supplies.— Probable Settlement of the Quarrel.

The probability of serious disturbances in Goldfield is increasing. A number of incidents contribute to bring about the present situation. The camp is infested by a number of agitators from all directions, and the criminal element of camp hangers-on is strongly in evidence. There are many men who cannot get work and a greater

The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

1. Etna	19. Tamarack
2. Empire	20. Osceola
3. Delaware	21. Tecumseh
4. Amygdaloid	22. Rhode Island
5. Copper Falls	23. Franklin, Jr
6. Central	24. Franklin
7. Phœnix	25. Arcadian
8. Cliff	26. Quincy
9. Mohawk	27. Isle Royale
10. Ahmeek	28. Atlantic
11. Allouez	29. Baltic
12. N. Kearsarge	30. Trimountain
13. Wolverine	31. Champion
14. Mayflower	32. Bell
15. Centennial	33. Adventure
16. Tamarack Jr	34. Mass
17. S. Kearsarge	35. Michigan
18. Calumet & Hecla	36. Victoria
	37. Winona

taken out in the course of development work and a few thousand tons of good milling rock is on the dump. Capt. James Bryant is in charge, the general supervision of the company's work being in the hands of Capt. Thomas Hoatson of Calumet, who is mining director for the Keweenaw company. The Medora shaft has a good surface equipment, consisting of shaft-house, two 150-h.p. boilers, a Lidgerwood hoist, 12-drill compressor, office and dry building, blacksmith-shop, machine-shop, and warehouse.

At a point about four miles north of the Medora shaft the Keeweenaw company is preparing to sink a shaft on the Empire property. This tract has been thoroughly tested with diamond-drills. The new shaft will be sunk on the Montreal River amygdaloid. Three diamond-drill cores of a favorable character have been taken from this formation. The first hole intersected the lode close to the surface; the second core was taken out at a depth of 400 ft., and the third drill-hole penetrated the lode at a depth of 1,300 ft. The Keweenaw company owns such a vast territory, extending nearly 11 miles on the stretch of the formation, that it has abundant room for the development of several large mines, if copper can be found in paying quantity. It will take many years to explore and determine the actual value of all the company's lands. The Mandan property gives indications of providing a good mine, the openings in the Medora shaft having a highly encouraging appearance.

number who are not looking for it. Between the miner and operators there is no trouble or ill-feeling, in fact, the Miners' Union is accused of siding with the operators. The fact is that times are prosperous alike for the miners and operators. Wages in Goldfield are now $5 per day for miners, while at Tonopah the men are far more content, and are only getting $4 per day. The origin of the trouble lies entirely with the agitators and a dispute between the labor organizations. The Industrial Workers of the World, an affiliation of various trades-unions, has tried to act with a high hand, and manage the affairs of the Western Federation of Miners and the Carpenters' Union. This was resented by the latter, and the trouble began. A determined fight is being made by the I. W. W. to prevent the Miners' Union from leaving them. The miners say they do not want their affairs managed by waiters and bartenders. Public sentiment, both among operators and working men, is running high against the I. W. W., though the latter retain a strong hold on the tradesmen by threats. Organized labor in Goldfield is now divided, the consolidated mines are shut down and many stores are closed, but there is no strike. At present it looks as if some little rioting and disorder may occur before any settlement is reached, because the feeling is fiery on both sides. The larger mines have little to lose by a temporary shut-down, and the lessees get an extension of time in case of labor troubles. The scarcity of mining timbers and supplies

had necessitated stopping work on many properties, in fact, the present cessation will be far more serious for the workingmen, who are suffering severely from the high price of supplies, than for the operators, who are awaiting the arrival of material. A depression in mining will be serious for some of the smaller companies, but it will probably eliminate many of the undesirable people and mining schemes, which infest Goldfield, without serious injury to the more stable enterprises. Everyone, miners and operators, clerks and waiters, wish to see these difficulties thrashed out once and for all, so that the mines and the many branches of business rooted in them may again thrive without the uneasiness and lawlessness, which has permeated Goldfield during the last few months.

Toronto, Canada.

A Canadian Department of Mines.—Shipments From Cobalt.—A New Gold District.— A Mass of Silver.— News From Cobalt Mines.— Several Rich Finds.— Smelter and Concentrator.

A bill has been introduced in the Canadian Parliament to create a Department of Mines, which will take over and reorganize the Geological Survey and the Mines branch, extending their scope. The Department will be in charge of a minister of the Crown, and the Geological and Mines branches will each be under a deputy minister. The public lands in Manitoba, Saskatchewan, and Alberta are under Federal jurisdiction, and one of the principal duties of the Department will be the regulation of the mining industry in those Provinces. Mr. Templeman, who represents British Columbia in the cabinet, is slated for the position of Minister of Mines. The Ontario Government has under consideration the construction of a branch of the Temiskaming & Northern Ontario Railway from Cobalt to Sudbury, to open up a rich mineral area. This policy has been steadily urged by the T. & N. O. Ry. commission, which operates the road for the Provincial Government.

Shipments of Cobalt ore for the week ending March 16 were 262 tons from the following mines: Nipissing, 159 tons; Buffalo, 50 tons; O'Brien, 32 tons; and Red Rock, 20 tons.

Dan Mosher, a veteran New Ontario prospector, and Capt. F. W. Coates, arrived in Toronto this week from the Abitibi country north of the Height of Land, where they have been working all winter, and report the discovery of a new goldfield. They found good silver and copper-bearing quartz, and staked 27 claims, on which they have had a gang of men steadily employed on development work for six months. Several shafts have been sunk, and the ore, in addition to other minerals, shows good gold contents. Camp buildings have been erected, and the fame of the new field, which is known as the Mosher Gold Camp, is attracting an influx of prospectors.——Harold P. Davis, of New York, president of the Davis Exploration Co., is seeking to interest Cobalt mining men in the Mines Exposition to be held in New York during April. It is hoped to get a representative exhibit of samples of Cobalt ores, as well as of mining machinery and processes.

A mass of silver was fonnd at the Temiskaming mine, Cobalt, on Mareh 16; it weighs 276 lb., and assays 12,000 oz. per ton. It was taken from the 75-ft. level. At the Empress mine the shaft has reached a depth of 52 ft., the vein having narrowed downward from 6 to 4 ft., the ore, however, being more highly mineralized.—— The Erie-Cobalt shaft has reached the 100-ft. level, and driving is being done westward so as to cross-cut other veins. The shaft is on a 14-in. vein, from which ore is being taken out.—— Silver has been struck on the North Cobalt mine in Bucke township at the 43-ft. level. The vein is calcite, of about 12-in. width, and interspersed with native silver.—— A calcite and slate vein, in alternate layers of about 30-in. width, has been discovered on the Cleveland-Cobalt property, about 16 ft. from the main vein. It carries native silver.—— An Ottawa syndicate, headed by George R. Lyon, has secured five locations just west of the Silver Queen and north of the Cleveland-Cobalt, and will begin development immediately. It is stated that on one of the properties there is a 14-in. vein running 600 oz. silver per ton.——At the Gordon-Cobalt the shaft is down 59 ft., at which depth a good find has been made, the vein being wide and well mineralized. A plant has been ordered comprising a 55-h.p. boiler, 40-h.p. engine, drills, etc.—— The Buffalo mine, second only to the Nipissing as a shipping mine, is working three shafts day and night. The main shaft is down 135 ft., with 400 ft. of drifts at the 70-ft. level, and 100 ft. of cross-cuts at the 130-ft. level, where 120 ft. of driving has been done. Shaft No. 5 has been sunk 97 ft., and is connected with the main shaft at the 85-ft. level by an adit 360 ft. long. No. 5 shaft is sunk on two veins that are being worked, and extensive driving has been done in several directions. The wall-rock in these veins is rich, containing much native silver in leaf form. No. 4 shaft is down 60 ft., and driving has been commenced at that level. An assay of ore taken from the bottom of this shaft showed 5,490 oz. silver per ton. Prospecting shafts have been sunk in several places on the property. T. R. Jones is the superintendent.

The small smelter at Hamilton, Ontario, which was used for some time by the North American Cobalt-Refining Co., composed of Cobalt mine-owners, in conducting experiments previous to constructing a large plant for the treatment of their ore, has been bought by W. G. Tretheway, who has withdrawn from the company. The ore from the Tretheway mine will be treated at Hamilton. The company is letting contracts for the building of a smelter at Thorald, Ontario. The Cobalt Concentrators, Ltd., has closed a contract with the Ore Reduction Co., Ltd., of Toronto, for the building and installation of a concentrating plant at Cobalt, with a capacity of 100 tons of ore per day, the total cost being $35,000. The machinery comprises the new process of dry concentration, by which it is claimed that any ore in the district can be successfully treated, and at least 90% of its value recovered.

Denver, Colorado.

Shortage of Labor.—Exodus to Nevada.—Newhouse Tunnel Stopped. —Long Adits Generally Disappointing.—Work of theGeological Survey.—Pumping at Cripple Creek.—Colorado College Adds to Its Equipment.

The excitement of the present developments in Nevada has had the effect of attracting miners in large numbers from the principal mining camps of Colorado, so that the present supply is hardly equal to the demand. The exodus is most strongly marked from the camps that are essentially prospective in their nature, and many camps that were thriving a few years ago now contain many deserted cabins. Whether, with the present high cost of living, this demand for labor will cause trouble is not yet clear, but so far no marked signs of it have appeared. Wages remain at the level they have maintained for years past and demands for increases have not been made.

After reaching a length of 17,500 ft., the Newhouse tunnel has been stopped. The companies already operating through it produce sufficient to employ its haulage equipment to full capacity and the organizers of the enterprise are now hoping to reap the reward of their expenditure. The water in the district as a whole is slowly being lowered by this adit. Numerous other

adits are under construction or are proposed. Strangely enough, few of them ever cut veins at points where the ore is rich, and as a rule the results of the investment are disappointing to everyone except the owners of mines above the tunnel water-level.

The geology and mineral resources of Colorado have been investigated in the past by the United States Geological Survey, and the results of the investigation have appeared in three monographs, three professional papers, seven bulletins, and ten folios of the geologic atlas, covering the more important mining districts of the State. Besides these many papers have appeared in the annual reports of the Director of the Survey and numerous other papers have dealt in part with Colorado. In addition many sheets of the topographic map have appeared, and many papers have been prepared by the Division of Water Supply & Irrigation. The State has shown itself slow to co-operate with the National Survey and work that otherwise could have been done at half cost or less to the State has been neglected. The best investment the State could possibly make would be to appoint a State Geologist who should have power to co-operate with the United States Survey, and to carry out such investigations himself as are not within the province of the larger organization.

Several properties on the eastern border of the Cripple Creek district have combined in a joint pumping arrangement. In this way the Portland, Strong, and Granite are to be drained by a pump on the Gold Coin mine's 1,200-ft. level. El Paso is contemplating closing down until the new drainage adit shall have reached it and unwatered its lower level.

The department of mining and metallurgy of Colorado College, at Colorado Springs, has added a Féry radiation pyrometer to its equipment and with this addition to its other instruments, is now better equipped for investigations into commercial high temperature problems than any other school west of the Mississippi. The problems developed in the roasting of the telluride ores of Cripple Creek are being studied to determine the temperature most suitable for conducting the roast, and later a study of the heat developed in the converting of copper matte will be made.

Johannesburg, Transvaal.

Satisfactory Output. — Interesting Details of Yields. — Chinese Behaving Better.—Hot Political Contest.—A Diamond Mine Boom.—Good Rainfall.

The returns for January, just published, are satisfactory. In December, 19,115 oz. of reserve gold were included in the output, so the returns for that month were inflated. For January no reserve gold was declared, which makes the total less than for December, but there is an actual increase in the monthly returns of 6,586 oz. The yield for January is therefore a record, and stands at 537,638 oz. Of course, the published output for December of 550,167 is higher on account of the reserve gold.

The Rand advanced in its stamping power last month. There were 50 more stamps at work. Outside districts, however, show a decrease of 10 stamps. During January there were 8,120 stamps at work on the Rand, and 330 in outside districts, making a total of 8,450 for the Transvaal. The Simmer & Jack was the first mine on the list, with an output of 24,419 oz.; the Robinson was second with 22,090 oz.; while the Robinson Deep was third with 20,047 oz. As regards profits, the Robinson establishes a record for the Transvaal, with £60,000. The Simmer & Jack made a profit of £47,078, and the Robinson Deep £40,939.

On January 31, 1907, there were 53,828 coolies available for the mines. Chinese labor for the month remained steady. Very little trouble was experienced from the coolies during January. There were practically no outrages.

Politics and politicians are the chief attractions just now. The combatants have come to close quarters, and the din of the battle is heard on every side. Dignity has been thrown to the winds, and some of the meetings have been as rough as any political meeting ever heard of in America. The epithets being used are somewhat spicy. For instance, in today's paper, one of the upholders of the Het Volk party refers to a leading knight of the Progressives in these words: "I declare that if he has been guilty of making the above statement, he is not only a malicious slanderer, but an unscrupulous liar." A bit warm, is it not? At the meetings on the mines we are hearing men refer to their opponents in anything but choice language. The press is simply full of politics, with comments on the candidates. All their past history, right back to Adam and Eve, is being dragged out for the benefit of the voters. Lurid cartoons and posters are to be seen on every hand. Electioneering agents of both sides are making themselves agreeable to

Map of South Africa.

the voters. People are getting tired, and will be heartily glad when the election is over. In my next letter I hope to be able to write of the newly elected members. Election day is on February 20. All kinds of discussion has taken place as to the granting of a holiday on the 20th. It has been decided not to make it a legal holiday, and the labor leaders are maligning the capitalists for this. No one pays much attention to the labor leaders. It is doubtful whether a single labor candidate will be elected.

The sensation of the week on the Stock Exchange was the phenomenal rise of the stocks of Lion Hill Diamond mine, a venture in the Orange River Colony. Three weeks ago these shares stood at 13 shillings each. Yellow ground was finally discovered by means of boring operations, and when the consulting geologist handed in a favorable report, there was a wild boom, the shares going up as high as £20. Today they stand at £14 10s. per share. Development work is being pushed on, and if the results are at all favorable, it is probable that the shares will go to £50. Quite a rise from 13 shillings!

During the past fortnight the Transvaal has been blessed with heavy rains, the best rainfall we have had for years. All the mine-dams are overflowing, and there is no danger of a scarcity of water for the mills. One or two smaller dams broke away, but no damage was done. In one or two mines there has been a rush of water into the workings, necessitating increased pumping and bailing.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

BRASS is an alloy of copper and zinc, or of copper, zinc, and tin.

ROLLED PLATINUM has a specific gravity of 22; gold, 22 carats fine, 17.49; pure lead, 11.33; pure silver, 10.47.

CLAY is the term applied to those earthy materials occurring in nature whose most prominent property is that of plasticity when wet.

WHEN inexperienced in estimating the amount of gold in the bottom of a pan or horn, a useful thing to remember is that a cent is a piece of gold about 1/32 in. square, and half as thick as a $5 piece.

AS a usual thing, in looking for placer gold, an abundance of quartz pebbles in the gravel is a good indication, especially when accompanied by black sand, garnets, and small, round pebbles of chrome-iron.

MOST of the boulders in ordinary placer ground are waterworn fragments of local rocks, the large proportion of quartz boulders being due to their hardness and ability to resist decomposition and corrasion.

THE distance between the bearings of a line-shaft should not be great enough to permit a deflection of more than 1/100 in. per foot of length; hence the bearings must be closer when the shaft is heavily loaded with pulleys.

THE ordinary gold pan is stamped out of a single piece of charcoal sheet-iron. It is about 16 in. in diameter across the top, and 2¾ in. deep, with flaring sides. Such a pan will hold about 25 lb. of gravel if heaped in the centre, and about 150 pans make a cubic yard.

IN the adjustment of the transit, the level tubes should be parallel to the vernier plate; the line of collimation should be perpendicular to the horizontal axis; the horizontal axis should be parallel to the vernier plate; and the intersection of the cross-hairs should appear in the centre of the field of view.

THE hydraulic elevator can only be used on moderately coarse material, as the diameter of the tube and the force of the lifting jet prevent the passage of very coarse material. Often the gravel is raised by elevators to a height of 30 to 50 ft., or more, and in this way the sluice-boxes can be from one-eighth to a quarter of a mile longer.

AN engine-stage is the division of a railroad to which an engine is limited, and over which it regularly hauls a train. Its length varies from 50 to 200 miles or more, depending on the grades, length of the whole line, and on the distance between points favorable for the situation of shops. The average engine-stage in America is not far from 75 miles.

CLAYS are always of secondary origin and result primarily from the decomposition of other rocks, very frequently from rocks containing feldspar, but there are some rocks which contain no feldspar (such as serpentine), and others with very little (as some gabbros), which, on weathering, produce some of the most plastic clays known.

WATER-WHEELS do not get all the power out of falling water. Undershot-wheels realize only about one-third; breast-wheels about one-half; overshots, from two-thirds to three-quarters; turbines and impact-wheels, from three-quarters to 85%. Large quantities of water under small heads are best utilized by turbines; but above 20-ft. heads, the impact-wheels will be found satisfactory, even up to 2,000-ft. heads.

THE right to use timber growing on an unpatented mining claim is limited to its necessary use *on the claim* for mining purposes. The abuse of this right will not cause a forfeiture of the claim, but will subject the transgressor to a civil action by the Government, and possibly to something more unpleasant. Whether cottonwood is 'timber' may be debatable. As a matter of prudence we would prefer that the judicial determination of this question should be at the expense of the other fellow.

WHEN a mass of rock, as, for instance, granite, is exposed to the weather, minute cracks are formed in it, due to the rock expanding when heated by the sun and contracting when cooled at night, or there may be joint planes formed by the contraction of the rock as it cooled from a molten condition. Into these cracks the rain-water percolates, and, when it freezes, it expands, thereby prying open the fissures or even wedging off fragments of the rock. Plant-roots often supplement the action of the frost. These processes alone may eventually reduce the rock to a mass of small angular fragments, or even to fine sand.

ANY error in the adjustment of a Y-level gives the line of sight a slight angle of elevation or depression, causing a slight error in every reading, proportional to the distance of the rod from the instrument. But the errors being equal for equal distances, and the backsights and the foresights having opposite signs in the calculations, the errors cancel when the distances are equal. Hence, to avoid errors in elevation, each new turning-point should be as nearly as possible at the same distance from the instrument as the point on which the last backsight was taken. For precise reading, the rod should not be more than 400 ft. from the instrument.

A LODE-CLAIM crosses a placer-claim within which there is a water-tunnel. It is sought to get credit as assessment work for the work done in the water-tunnel within that part of the lode-area in conflict with the placer-claim. The water thus developed is carried off the placer to another lode-claim upon which there is a quartz-mill, where the developed water is utilized for milling purposes. It is obvious that work done for the avowed purpose of developing water on the placer within the area common to the first lode-claim and the placer for use elsewhere does not tend to develop the lode-claim within which the work was done or facilitate the extraction of its ore, and this is the test. Without attempting to prejudge the case, we think this is skating on thin ice.

WESTERN AUSTRALIA forms a tableland of moderate elevation surmounted by short and low ridges. Crystalline schists and granites are the principal rocks of which this plateau is constructed. The schists extend with general north-south strike and vertical or steep dip across the whole central part of the State and consist largely of amphibolites, massive or foliated, which have been derived by matamorphism from a basic rock like diorite, gabbro, or diabase. There are also highly altered sedimentary rocks such as quartzites, slates, etc., more rarely limestones. At Kalgoorlie, for example, slates are intimately associated with amphibolites, and on a more extensive scale these altered sediments are developed in the Pilbara district on the northern coast.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Tube-Mill Lining.

The Editor:

Sir—The experience of Mr. A. E. Drucker, in Korea, as given in your issue of November 17, 1906, is interesting. To my mind, the reasons why he obtained such very unsatisfactory results in his ingenious experiment are the following:

(1) His mill is probably too light in construction, thus allowing the lining to 'work.' Any continuous bonding movement in the walls of his mill must gradually break up his lining, which is in one continuous long length.

(2) I think it was a mistake to make the lining in two distinct layers and to cover the tops of the rails.

In reference to my 'honeycomb' linings which he refers to as 'proposed to be used,' I can assure him there is no doubt about the matter, they have actually been in use for over a year, showing over three times the life of imported silex. Nine tube-mills are now running in Waihi with my patent linings.

By dividing up the spaces, as I do, the lining material has not the same chance of working loose as in the method tried by Mr. Drucker. He is quite right in saying that no cement will stand the terrific wear, but it only wears to a certain depth, when it becomes protected by the quartz projecting around it. If Mr. Drucker has a foundry handy I am sure he will find it worth while to try my system, as his only difficulty seems to be in holding the quartz in position and not in the wearing quality of the quartz lining.

H. P. BARRY,

Waihi Gold Mining Co. Ltd., Waihi, New Zealand, February 1.

Tappets and Cams.

The Editor:

Sir—You will confer a kind act on me and other millmen, if you will mention in your paper the annoyance I have had through an order for tappets, cams, and guides.

I ordered the tappets bored for 3¼-in. stems and the cams for a shaft of 5 in. diam. The tappets came bored 3/32 in. less than the stems and the cams ⅛ in. less than the shaft. The foundrymen tell me that this is the present standard system in shaft-measurement. I know that there is such a gauge in cold-rolled shafting, but it is new to me, in regard to mill-stems and cam-shafts, although I have milled off and on for 34 years. I have gained the reputation of being a careful and conscientious man and feel this botch very keenly. Of course, in future, I shall state *actual measurement by rule*, and wish to warn my fellow millmen to do the same.

MILLMAN.

Los Angeles, March 10.

Tufa and Tuff.

The Editor:

Sir—Just a few words in relation to the enclosed clipping from your issue of February 16. "Tufa is a cellular deposit of mineral springs, usually calcareous or silicious. The name is not to be confused with tuff, which is the name given to the finer, fragmental ejectments from the explosive eruptions of volcanoes." Your definition of 'tufa' and its origin is correct. So also as to 'tuff,' except that you do not go far enough to show that tuff can, and is, found in other ways than by the "explosive eruptions of volcanoes." Like eruptive rocks, tuff originates in two ways—first, volcanic ejections, and secondly as a dike material. In Arizona and Mexico, in Cochise county and in the State of Sonora, the source of all lava rock is from fissures and not volcanic or thrown out by violent explosions. The same is true of the tuffs found in the above localities. In Sonora great dikes of porphyritic tuff, rhyolite tuff, etc., exist, and can be traced for miles. Now the point I wish to make is this: That those dikes of tuff, as above classed, are fissure veins filled and formed in a like manner to metalliferous veins, minus the metal. From Cananea southeasterly two or three hundred miles, in a mineral zone several miles wide, many of these tuff veins or dikes are to be seen. They occupy a place in this great mineral belt, and undoubtedly owe their presence to an altering agent contained therein. Their dip is nearly vertical and the strike cross-wise to the trend of the metalliferous veins. That they are part and parcel of the rock in which they exist, there can be no doubt, the parentage and relationship is too evident to permit of question or argument. Porphyritic tuff is found in porphyry, and rhyolitic tuff in rhyolite, and andesitic tuff in andesite, and so on. Again, a vein or dike of black obsidian four feet wide is found. Now you would not say that this had its origin "from explosive eruptions of volcanoes," would you?

T. F. JAMES.

On the Train. March 5.

[No, we would not. We would call it a lava or compromise by labeling it tufaceous lava.—Editor.]

The Salton Sea.

The Editor:

Sir—In regard to the popular idea that the Salton Sea has changed the climate: I remember back in '69 in Nevada that there was a wet cycle of years culminating in '74 by the removal of a large part of the town of Eureka, and the drowning of 15 people, by a flood down the cañon. Old-timers in Arizona will testify that about that time grass and water were plentiful in the land, as they have been in the last three years. By the rain records the year '84 was by far the wettest year in the history of this Coast. In '89 I started as helper with a 16-mule team from Phœnix to Wickenburg. It rained. By using much profanity and many buckskin poppers we made eight miles in five days. Then by chaining the mules together so that when one went under the mud the others could pull him out, we miraculously got back to Phœnix without any of the outfit being drowned. I saw it rain more in this part of the country in three months in '96 than it has rained in the whole of the last three years. All the foregoing happened when there was no Salton Sea, which may seem singular to a good many people nowadays.

Only about 75 or 100 miles south of the Sea lies the Gulf of California, a body of water 50 times the area of Salton Sea, with the same conditions of evaporation and distribution of its vapors. Why has the Gulf of California not been deluging the country with floods of water? This would be a very wet country indeed if that Gulf had been dropping 50 times as much water as the imaginations of a great many people have made the Salton Sea to drop. In traveling over an area of 300,000 square miles in Arizona, Nevada, and California, I find the same impression that the Salton Sea is the cause of it, and for aught I know they may have the same idea away over in Texas and up in Oregon, where it rains all the time. The area of Salton Sea is, I suppose, about 1,500 square miles, and I suppose that an evaporation of six or seven feet of its water in the last two years would be a fair estimate, which, if spread out, would cover 10,000 square miles of surface 12 in. deep. Now I think that there has fallen 12 in. of rain in the last two years on the 300,000 square miles of area mentioned above; if so, the

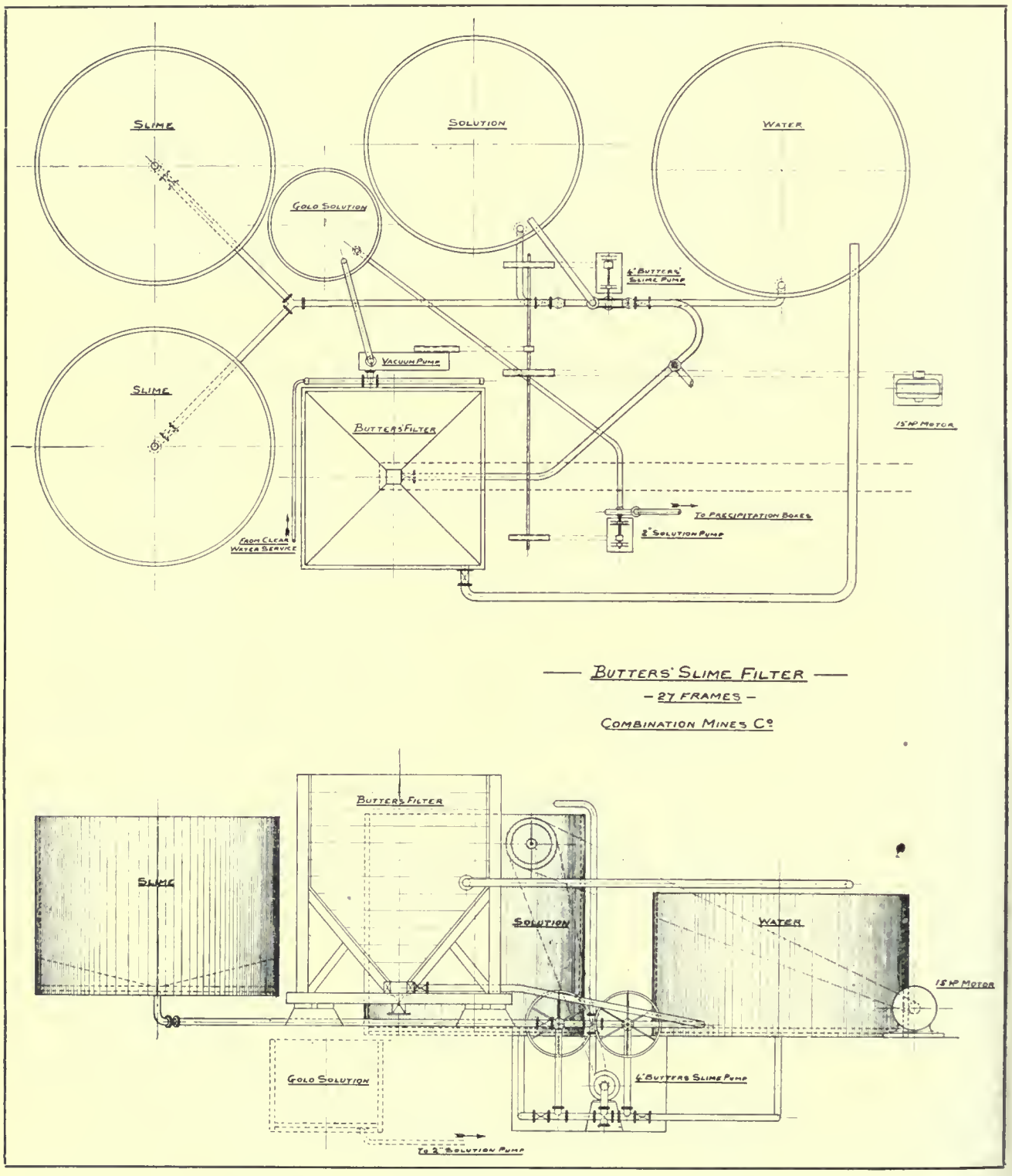
evaporation of Salton Sea would equal only one-thirtieth of the rain which it has been supposed to be furnishing. An increase of only one-thirtieth of the annual rainfall would be so small as to pass unnoticed.

It seems to me that in watching the Salton Sea so intently, we have forgotten about the Gulf of Mexico and the Pacific Ocean, where the rain used to come from.

WM. R. BAILEY.

Needles, March 7.

My error in regard to the number of filter-leaves at Millers was due to the fact that 216 leaves were billed to the company. I presume that it has been found that less leaves will treat their slime. I should perhaps have said that, "a plant designed according to my ideas," instead of "a properly designed plant," would be arranged for a maximum lift of 10 ft. I enclose a tracing covering this point. The *average* lift is of course much less, varying from minus 10 to plus 10 ft. This is Mr. Bosqui's



The Butters Filter.

The Editor:

Sir—As Mr. Nutter says, in your issue of February 16, the data given in my former criticism were not taken from the plant at Millers, since at the time of my visit to that camp, the plant was not in operation.

I am glad to get the data supplied by Mr. Nutter, and knowing the possibilities of the filter, I feel sure that the results now being attained by Mr. Parsons will shortly be even better.

arrangement at the Combination mill at Goldfield, Nevada. The actual maximum lift varies from hour to hour, depending on the stage of the tide in the various tanks of pulp, solution, and water. It is therefore clear that any construction entailing a maximum lift of 25 ft. will necessitate large pumps (or more time) and more power. The tracing sent you is wrong in showing the discharge from the pump to the wash solution tank as going over the top of the tank. This should be connected to the tank below the low-water level. It will be easily

seen from this drawing that the greatest possible lift would occur in returning pulp or solution, with the storage-tanks full at the moment that the filter-box was empty. This tank is 10 ft. higher than the outlet of the filter-box, and I am unable to see any advantage to be gained by increasing this height. The same arrangement can be applied to a plant of whatsoever size.

As regards the cubic capacity of the filter-box, I must explain that this depends upon the spaciug of the leaves, and this spacing depends upon the nature of the slime treated. As an example, experiments are being made upon slime here in Guanajuato of which a cake 1½ in. thick forms with a 22 in. vaccum in 30 min. This slime necessitates a spacing of five or more inches (instead of four). The filter-box for this slime will be 5 ft. 10 in. from the top of the filter-leaves to the hopper, and the latter will be 6 ft. 3 in. deep. I repeat that for 250 leaves for slime ordinarily produced in milling, a Butters filter-box should not exceed 7,000 cubic feet.

As regards the time and size of pump necessary for transferring pulp and water, and taking Mr. Nutter's figure of 1,900 cu. ft. as the displacement of the loaded leaves, 5,100 cu. ft. of pulp would have to be transferred. A 10-in. pump (I have no data at hand on the capacity of a nine-inch pump) would actually require "according to the manufacturer" 7.5 min. and 15 h.p. to do this.

As regards filter repairs, it is hardly putting it strongly enough (in view of the fact that Butters filter-leaves have been in operation over two years without any signs of deterioration) to merely say that filter repairs are "less" for the Butters than for the Moore process. One of the great points of superiority of the Butters method is that the leaves hang perfectly still, and are subject to no strains, are not scraped (as are the "better type at Bodie") or even touched for months at a time.

As a point of interest, I may state that the filter now being constructed for the Pinguico mill of this place, is designed on "gravity" lines, as illustrated in your issue of recent date, and not "all pumping;" and in this case (where the filter is filled and emptied by gravity, and the pulp returned from a low sump-tank) their maximum lift will not exceed 30 feet.

I must not be suspected of being convinced of the merits of the Butters filter on account of being interested in its success—rather the contrary, having become interested after conviction as to its merits.

MARK R. LAMB.

Guanajuato, Mexico, March 6.

[Having been favored by Mr. Lamb with a copy of the foregoing contribution, Mr. E. H. Nutter writes to say that "the filters at Bodie have not been, and are not, scraped in order to clean off the cake. The discharge is accomplished entirely by blowing the cake off with compressed air, as stated by Mr. R. Gilman Brown in an earlier article."—Editor.]

Assay of Cyanide Solutions.

The Editor:

Sir—Will you kindly publish the following scheme for the assay of cyanide solutions; it is a modification of Crosse; it is quick and accurate, does away with tedious evaporation, and chance of loss, and the furnace.

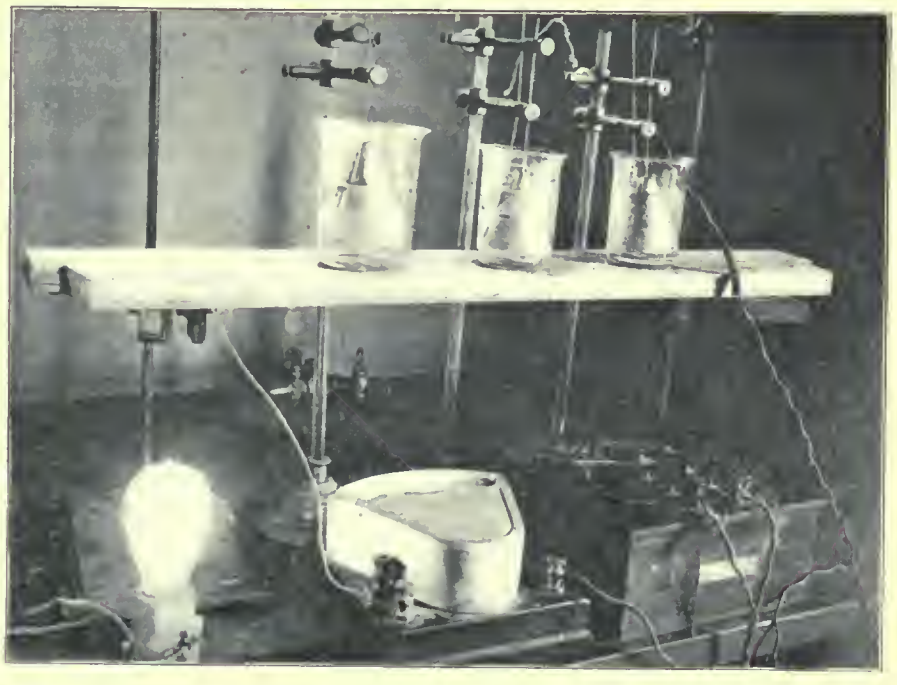
Measure 30 c.c. KCy (working solution), add silver nitrate solution used ordinarily in titrating, until precipitate ceases to form; the gold is all now precipitated as argenti-auric cyanide.

Allow precipitate to settle; decant clear solution, then with wash-bottle transfer precipitate into small funnel, using thin paper; wash several times to get precipitate well down into point of paper; draw out paper and cut off just above the precipitate; place this cone into a hole cut in charcoal, blow-pipe, flatten, part, anneal, and weigh.

H. W. GENDAR.

Ballarat, Cal., March 5.

[Many thanks. Such hints are useful.—Editor.]



Apparatus for the Electrolytic Assay of Copper Ore.

Electrolytic Copper Assay.

The accompanying photograph shows the electrical apparatus used by E. R. Pichrell, a senior student at the Washington State College, in experimenting upon the electrolytic assay of copper ore. The ores treated came from Phœnix and Rossland, B. C., from Butte, Montana, from Hadley in Alaska, and from two camps in Washington. They ran from 1 to 70% copper. It was found that by using a direct current of 120 volts and stepping it down with an 8-volt light and rheostat to a current of 0.5 amperes and 8 volts the electrolytic copper assay could be made in the short time of 2½ hours, instead of 12 to 14, as is usually the case in assay-offices using this method. In all the experiments exceedingly accurate results were obtained. The samples were run in triplicate and most of them checked to hundredths, the average variation being one-tenth of one per cent.

THE temperatures at which some of the metals fuse are as follows, all expressed in degrees Fahrenheit: Tin, 442; zinc, 773; lead, 617; silver, 1,832; copper, 2,200; gold, 2,518; iron, 2,800.

Some New Points in the Geology of Copper Ores.

Contributed to the MINING AND SCIENTIFIC PRESS
By JAMES F. KEMP.

*During the past year or two cobalt and silver have been the metals most prominently in the foreground in Ontario; but south of the national boundary and in other parts of the world, copper has occupied the centre of the stage. The growth of electrical applications and the increasing consumption of brass have made the market wellnigh insatiable. Copper mining has greatly increased, and with the growth of new districts and with widening experience, we have found it necessary to modify some of our old-time conceptions.

Twenty-five years ago when the classes in the mining schools were taught the mineralogy of the ores of copper, it was chalcopyrite that was esteemed the principal mineral. Of course the importance of the native metal on Keweenaw Point† was appreciated, but we used to define an ore as "the compound of a metal and a mineralizer such as sulphur or oxygen"—and the native form, even though abundant in one locality, was thus ruled out. Experience with the lenticular beds or veins, in the slates and schists along the Appalachian belt from Sherbrooke, Quebec, to Ducktown, Tennessee, and the historic orebodies of the Rio Tinto district in Spain, whose geological relations are similar, gave good ground for the esteem in which chalcopyrite was held. It was considered, moreover, to be the original mineral from which the others were generally believed to have been derived. Observers of those days were perfectly familiar with the oxidized zone, and with the zone of enrichment, at the level of the ground-water. At the latter horizon the Ducktown mines had taught all of us in America that rich black ores were precipitated, but the dark mineral was for many years believed to be the oxide, tenorite or melaconite, until W. H. Weed proved it to be chalcocite. Chalcocite was esteemed to be rather uncommon, and, when we students saw it at all, it was chiefly in the crystals from the old copper mine at Bristol, Connecticut, an enterprise that had astonished its shareholders rather by the lack of copper than by its abundance.

Today, on the contrary, in the United States and Mexico, chalcocite furnishes much the largest part of the copper produced, and for some years to come its relative importance bids fair to increase rather than diminish. Butte, Morenci, Bisbee, Globe, and Cananea derive most of their output from it, while Bingham and Ely will soon be concentrating the glance from the porphyries on an enormous scale.

So far is chalcopyrite from being the principal and original mineral at Butte that, on the one hand, it is rather uncommon and, on the other, it is one of the latest of the secondary minerals, since we find it in veinlets cutting covellite. The original mineral alike at Butte and in Arizona appears to be a lean copper-bearing iron pyrite, which is then, by secondary enrichment, oxidized in one place and deprived of its copper, only to gain the latter elsewhere in the form of chalcocite, which brings the lean original up to grade.

In later years and for a period lasting well up to the present, we laid great and just emphasis on the processes of secondary enrichment by the descending surface waters. We believed that the new chalcocite and other minerals were deposited at the level of the ground-water and for a limited distance below it. That is, we gradually grew to recognize the necessity of a greater diffusion of the descending copper solution throughout the quiet ground-water than we had at first thought either necessary or probable. But in the issue of the MINING AND SCIENTIFIC PRESS for February 23, 1907, page 236, we learned that a cross-cut in the Berlin claim at Butte had cut a great body of glance, at 1,800 ft. from the surface, and that in the Neversweat, at 2,400 ft., a similar occurrence had been noted. Even before this it was generally reported that a cross-cut from the shaft at 2,000 ft. in the Speculator claim had intercepted these rich ores in a still different lode.

Various suggestions tending to reorganize our old views either have been made or may be made in consequence of these discoveries. The hillside on which the copper mines are situated at Butte rises gradually to the north from the valley of Silver Bow creek, or more steeply to the west from the same creek at Meaderville. In the latter area shafts are said to have found the bedrock under 600 ft. of overlying loose material. Obviously, as the valley was excavated by erosion, and as the former representative of Silver Bow creek established the low point of the ground-water upon its bedrock itself, the subterranean water-level must have risen from this point, in the hill, roughly following the surface, but at a flatter slope. The present outcrops of the copper veins are from 500 to 700 ft. above the present valley, or from 1,100 to 1,300 ft. above the bedrock. To estimate the ancient level of the ground-water we must diminish 1,100 to 1,300 by such figures as will allow for its rise, roughly parallel with the surface. Whatever assumptions we make, moreover, regarding wall-rock and vein-matter removed by erosion, but operate to further raise the ground-water level. It certainly can scarcely have been lower than 800 to 1,000 ft. below the collars of the present shafts. The recently discovered bonanzas are from 1,000 to 1,500 ft. below this level, and, according to our old ideas of the diffusion of the descending copper-bearing solutions, they must have penetrated at least 1,000 to 1,500 ft. of standing water. This seems unlikely.

On the other hand, we may raise the question, could the ground-water have been so irregular in its distribution that no standing body of it intervened to stagnate the descending water? This seems unlikely. Again, is chalcocite necessarily a secondary mineral? May it not be of original deposition? Experience thus far leads us to think that the presumption of its secondary nature is well grounded.

Most reasonable of all would appear to be W. H. Weed's suggestion of secondary enrichment by uprising solutions of copper—set in action perhaps by the late rhyolite. From these no lean pyrite of primary deposition thus far observed would be too deep to escape, although solutions of oxidized copper salts such as bring about the enrichment by descending surface waters are not what we associate with waters uprising from the depths. Mr. Weed applies his conclusions especially to the enargite at Butte, but, as the glance is being found deeper and deeper, we may at least raise the question whether its lower deposits may not also have been introduced from the depths.

Ten years ago, or even less, great apprehension was felt about the persistence of the ore in depth. The newly appreciated doctrines of secondary enrichment from above had emphasized and increased the misgivings, and much experience corroborated them. Rio Tinto was most often cited, where, in the San Domingo vein or lens, 4 to 5% of copper had been obtained at the surface; 2% at 260 ft.; 1½ to 1¾% at 325, and 1¼% at 425 ft. In the Dionisio there was 4% at the surface; 2% at 650, and 2½% at 1,500 ft. In the last citation there was a ray of comfort, but the general result was decidedly discouraging. At Butte, too, the general yield of the ores has

*Read at the meeting of the Canadian Mining Institute, Toronto, March 8, 1907.
†The copper region of Lake Superior.

gone down. A few years ago it was 5 to 6%; now it is 3 to 4%. In Arizona 15 to 20% was not uncommon twenty years ago. The ores run 6 to 7% now and the glance in the porphyries 3% as it goes to the mill. Improved transportation and milling processes are responsible for bringing lower and lower ores within the range of profit, and, as we must realize, there is the tendency steadily to reduce the general average; but if, at Butte, 40% ore occurs in great stopes at 1,800 ft., and 60% ore at 2,400 ft., we may raise the question as to whether the old-time generalization is as sweeping as we formerly thought.

Reverting again to the time-honored conceptions of the lenticular orebodies or *kieslager* of the slate and schist of the Appalachian belt and of Rio Tinto, many of us will recall that these were esteemed our typical deposits. But in later years developments in the southwestern United States, in Mexico, and in Queensland, have proved the frequent occurrence and great importance of garnet zones produced by contact metamorphism in limestone along intrusive rocks. Bisbee and Morenci in Arizona; San Pedro, New Mexico; Aranzazu and San José, Mexico; Chillagoe, Queensland; and many more, have shown the importance and wide distribution of this type. Garnet, vesuvianite, wollastonite, and diopside are the associated minerals, and the orebodies are of irregular shape. They often need secondary enrichment to bring them up to grade. They are not lenses as are the ores at Thedford and Rio Tinto; nor veins as at Butte; nor beds as at Mansfeld; nor impregnations of shattered rock as at Nacosari; but are a new type when compared with our old conceptions.

One of our tendencies in earlier years was to connect orebodies, especially of copper, with basic eruptives. Keweenaw Point and Sudbury gave good support to these inferences. It was also natural to infer that, as iron and the other bases increased in rocks, therefore copper, lead, and other metals would do the same in less degree. But recent experience is just the opposite in the case of copper. Globe, in Arizona, with its diabase, and the Nikolai and other greenstones of the Northwest coast are almost the only basic ones that appear in the newer districts. On the contrary, we find quartz-bearing rocks of various kinds, and more especially a fairly acidic variety midway between syenite and diorite, called monzonite. Bingham, Ely, Bisbee, Morenci, Nacosari, and the granite at Butte all afford a similar experience. The great deposits of northern California are in rhyolite porphyries. We cannot but reflect that the acidic magmas are richest in dissolved vapors, that they probably in cooling yield relatively abundant magmatic waters; and that, being at the outset copper-bearing, the orebodies are perhaps due to these characteristics.

But the most striking feature of the last year or two is the tendency of mines first worked for other metals to yield copper in depth. From Butte we learn that the silver mines along the Rainbow lode, in which, in the upper workings, no copper was found, are now showing as much as 3% at 1,000 ft. The old Black Rock claim, once a silver mine and a participant in the famous Black Rock-Niagara apex suit, is being revived and deepened for copper; and others in the vicinity are actually yielding the red metal. The Cable gold mines farther west in Montana supply now 3% ore to the Washoe smelter. Bingham, once a lead-silver camp, has changed to copper. From Leadville the same report has been coming for some years, that much copper was found with the unchanged sulphides in depth. At Red Mountain, where, near the surface, lead-silver was formerly the yield of the ore, now, in the 1,100-ft. adit into the mountain, copper has been found. In North Carolina, some gold mines of former years have become copper mines today. Most striking of all, at the great Mt. Morgan gold mine at Queensland, the diamond-drill, at 725 ft., has shown great bodies of copper-bearing sulphides, which now go to the furnace, as the earlier gold ores went to the chlorination mill.

We have for years known that lead above often passed into zinc below. We may perhaps now add a still deeper copper zone, when, in the uprising waters that brought in the ore, copper was present with the other two. Gold above may also change to copper below, or be associated with it, and apparently not always because copper once general throughout the vein has passed downward with the atmospheric waters.

An interesting corroboration is thus afforded of views advanced by W. H. Weed in the paper already cited, of which one of the closing paragraphs is: "Ascending hot-spring waters, if metalliferous, may deposit different ores with an orderly vertical distribution. Existing veins now mined often show their arrangement of metallic sulphides." *

Sulphur in Utah.

Sulphurdale is a small mining camp about 20 miles north of Beaver, Utah. The deposits are locally known as the Cove Creek sulphur beds. Cove Creek sulphur has supplied the local market for about thirty years, the average annual output being estimated at 1,000 tons. An area of several acres has been exploited, but the lateral extent as well as the depth of the deposits is unknown.

Some of the sulphur occurs in cylindrical masses or cores 10 or 15 ft. in diameter, having a rude radial structure as if they had been formed about a central vent extending indefinitely downward into beds of tuff. But it occurs mainly as a dark-colored impregnation or cementing substance in the rhyolitic tuff. In certain places it appears as irregular veins of nearly pure, yellow sulphur ramifying through the beds. Occasionally a smaller cavity is found lined either with flowers of sulphur or with sulphur crystals.

This sulphur is probably the result of volcanic action, as shown by its presence in a volcanic region where recent eruptions have occurred. Gas is escaping in large volumes, in some areas by thousands of small jets from the porous beds of tuff. Wherever water is found standing in the excavations, the gas is noted boiling up through it at short intervals.

The ore varies in richness from a trace to practically pure sulphur. Samples taken at the extremities of the workings and analyzed in the laboratory of the Geological Survey were found to contain respectively 80 and 65% sulphur. Material running as low as 15% is considered paying ore. At the smelter the ore is placed in iron retorts and the sulphur is melted out by steam. Analysis of the product, as it comes from the retorts, shows that it contains 99.71% sulphur, 0.23% non-volatile residue, and 0.06% moisture.

In the gold belt of Western Australia all the characters of the deposits point to genesis under conditions of great depth and dynamic metamorphism; the deposits, although occurring mostly in amphibolites and slates, are later than the granites intrusive in the former rocks, and are probably in closest genetic relations to the granites. Analogous occurrences are those in Victoria and California, where the gold veins are usually contained in the schists and slates, although they assuredly were formed closely after the intrusion of great masses of granitic magma.—W. Lindgren in *Economic Geology*.

* *Trans.* Amer. Inst. Min. Eng., Vol. XXXIII, p. 754, 1903.

A Simple Classification of Igneous Rocks.

Prepared for the MINING AND SCIENTIFIC PRESS
By SCOTT TURNER.

The accompanying table is designed to help in the identification of the common eruptive rocks. It is arranged in a condensed form and is based on Rosenbusch's classification and a subsequent more elaborate tabulation by F. E. Wright. The general heading 'Lime-Alkali Series' is given to distinguish this group from the rare group in which the feldspars contain no lime, and which is known as the 'Alkali Series.' The rocks of the alkali series are generally characterized by a duller color, and the only rock of special importance that it contains is phonolite, which does contain some alkali-feldspar, along with nephelite or leucite, and is porphyritic in texture.

Identification is accomplished with this table, by means of two co-ordinates, arranged in horizontal and vertical columns. These co-ordinates are texture and mineralogical composition. The three abcissæ thus are the three textures, namely, granitic, holocrystalline-porphyritic, and porphyritic. The first needs no explanation, being a term suggested by granite, and used to describe those igneous rocks that are composed entirely of recognizable minerals, approximately the same in size, and in which there is no groundmass. Hypidiomorphic-grained is a term that has been used to describe the same texture. The rocks included under the second head of holocrystalline-porphyritic texture, are those that are entirely crystalline, but with crystals of different size, and no groundmass, giving a porphyritic appearance. They are deep-seated magmas that have solidified in dikes, with the same chemical composition as the deep-seated forms. The third heading—porphyritic texture—includes those rocks that have comparatively large crystals or phenocrysts, embedded in a finer-grained groundmass, which is often finely crystalline, but which may be even glassy in some cases. The name of the holocrystalline-porphyritic rock is formed by adding 'porphyry' to the name of the corresponding deep-seated variety, if the feldspar is orthoclase, and 'porphyrite' if the feldspar is plagioclase.

The characteristics that are arranged as vertical co-ordinates, refer to the mineralogical composition of the rock, which, having been once ascertained, and considered in connection with the texture, determines at once the position of the rock in the table. For instance, if it has been ascertained by inspection of the hand-specimen, or the thin section under the microscope, that the texture is porphyritic, and the principal mineral constituent a feldspar with no triclinic striations showing, and probably an orthoclase variety, and that there is no quartz present, glancing down the 'porphyritic' column to the point where the 'alkali feldspar, no quartz' horizontal division meets it, it is seen that the rock is trachyte.

The chemical composition of the rocks in the granitic and porphyritic columns is given. These are average values, obtained from the analyses of several typical individuals in each class. The silica and alumina content is given for each; also the iron oxides, including FeO and Fe_2O_3; the alkaline earths, MgO and CaO; and the alkalis, Na_2O and K_2O. The water, and the titanic and phosphoric acid content are not given, as they are relatively unimportant, and small in amount. The amount of water varies from 0.6%, to a maximum of 3% in the peridotites, and 5% in the picrites, but seldom exceeds 1% in the others. The phosphoric acid ranges from 0.1 to 0.3%, and the titanic acid, TiO_2, runs from 0.3 to 0.9% in the rocks included in the table. An increasing basicity will be noted in proceeding from the top to the bottom of the table; the granite is the most acid of the deep-seated rocks, with a silica content of about 68%, and the pyroxenites are the least acid, with only 43% SiO_2, all others being intermediate between these two extremes. In the porphyritic column, the rhyolite is the most acid of all, with 75% SiO_2, while the basalts contain only 50% of silica.

Only the essential components are given in the classification. The tabulation might be made more complete by including, besides the essential components, the appellative as well, which might be still further subdivided into auxiliary and accessory constituents. The table being condensed, these are omitted in column-tabulation, but show in the variety names under the general family head. Thus, it will be readily understood that a hypersthene-granite is a granite containing the mineral hypersthene as an auxiliary component.

Under each family head are grouped the more definite variety-names, which are determined by the appellative constituents, and other characteristics. Thus:

GRANITE is the general name for the family, and is typically a rock containing quartz, feldspar (orthoclase and oligoclase), and mica (biotite and muscovite).

GRANITITE is a special name for a biotite-granite.

AMPHIBOLE-GRANITE, PYROXENE-GRANITE, and HYPERSTHENE-GRANITE, explain themselves.

RHYOLITE is also called QUARTZ-PORPHYRY, and LIPARITE. Under this name are grouped a list of more definite terms that are used as prefixes to the family name. Thus:

MICROGRANITIC-RHYOLITE is one in which the groundmass consists of quartz and feldspar crystals on a small scale, but shows under the microscope as granitoid in texture. GRANOPHYRIC-RHYOLITES are those in which the quartz and feldspar crystals have formed simultaneously and inter-penetrate each other. FELSITIC-RHYOLITES are finely crystalline, and have but few, or no phenocrysts. VITROPHYRIC-RHYOLITES have glassy groundmasses. OBSIDIAN is volcanic glass. PITCHSTONES are hydrated rhyolites with a resinous lustre. PEARLITE is hydrous, with a concentric structure. PUMICE is a cellular variety.

GABBRO, as a variety-name, indicates the presence of diallage.

NORITE is a gabbro with plagioclase and orthorhombic pyroxene, generally hypersthene.

ANORTHOSITE is principally labradorite.

BASALT, as a family-name, includes all dark, basic volcanic rocks.

BASALTS and MELAPHYRS, as used in the table, are dark colored, dull rocks, often either aphanitic or fine-grained, with basic lime-alkali feldspars and augite. Rosenbusch uses melaphyr to mean a pre-Tertiary olivine-basalt.

DIABASES are a special form of basalt. Strictly speaking, they are not porphyritic in texture, the diabase texture being peculiar to this form. In the diabase texture the feldspars are lath-shaped, and well formed, the augite crystals filling the interstices. They are often green in color.

In the table, the class of acid and basic differentiation products is omitted, although it might be arranged in a fourth column under a general head of dike rocks. The APLITES AND PEGMATITES are the chief ones. APLITES are young dike rocks, occurring in nearly all granitic areas, and are simply a muscovite-granite dike rock, finely crystalline, containing no colored constituents, and with small cavities into which well-formed crystals project. PEGMATITES are coarse-grained quartz-orthoclase feldspar dike rocks, containing large feldspar individuals, with several quartz-masses which show prominently in each feldspar cleavage face, and intercalated between the feldspar individuals.

Condensed Table.

ERUPTIVE ROCKS.

Lime-Alkali Series.

MINERALOGICAL COMPOSITION

TEXTURE

Essential Components	Granitic — Chemical Composition	Granitic — Deep-Seated Rocks	Holocrystalline-Porphyritic — Porphyritic Dike Rocks	Porphyritic — Effusive Rocks	Porphyritic — Chemical Composition
Alkali Feldspar and Quartz and Some Lime—Alkali Feldspar	Silica 68% Alumina 15 Iron oxides 4 Alkali earths 4 Alkalis 8	**Granite** 1. Granite 2. Granitite 3. Amphibole-Granite 4. Pyroxene-Granite 5. Hypersthene-Granite	**Granite-Porphyry**	**Rhyolite** (or Quartz-Porphyry) 1. Microgranitic 2. Granophyric 3. Felsitic 4. Vitrophyric a. Obsidian b. Pitchstone c. Pearlite d. Pumicestone	Silica 75% Alumina 13 Iron oxides 2 Alkali earths 1 Alkalis 8
Alkali Feldspar but No Quartz and Some Lime—Alkali Feldspar	Silica 59 Alumina 17 Iron oxides 7 Alkali earths 9 Alkalis 7	**Syenite** 1. Mica-Syenite 2. Hornblende-Syenite 3. Augite-Syenite	**Syenite-Porphyry** 1. Mica-Syenite-Porphyry 2. Hornblende-Syenite-Porphyry 3. Augite-Syenite-Porphyry	**Trachyte** 1. Mica-Trachyte 2. Augite-Trachyte	Silica 63 Alumina 17 Iron oxides 5 Alkali earths 4 Alkalis 10
Acid Plagioclase Feldspar and Quartz	Silica 63 Alumina 17 Iron oxides 6 Alkali earths 8 Alkalis 6	**Quartz Diorite** 1. Quartz-Mica-Diorite 2. Quartz-Hornblende-Diorite 3. Quartz-Augite-Diorite	**Quartz-Diorite-Porphyrite** 1. Mica-Quartz-Diorite-Porphyrite 2. Hornblende-Quartz-Diorite-Porphyrite 3. Augite-Quartz-Diorite-Porphyrite	**Dacite** 1. Mica-Dacite 2. Amphibole-Dacite 3. Pyroxene-Dacite	Silica 68 Alumina 15 Iron oxides 4 Alkali earths 5 Alkalis 7
Acid Plagioclase Feldspar but No Quartz and Some Alkali Feldspar	Silica 55 Alumina 18 Iron oxides 9 Alkali earths 12 Alkalis 5	**Diorite** 1. Mica-Diorite 2. Hornblende-Diorite 3. Augite-Diorite 4. Hypersthene-Diorite	**Diorite-Porphyrite** 1. Mica-Diorite-Porphyrite 2. Hornblende-Diorite-Porphyrite 3. Augite-Diorite-Porphyrite	**Andesite** 1. Mica-Andesite 2. Hornblende-Andesite 3. Augite-Andesite 4. Hypersthene-Andesite 5. Labradorite-Andesite	Silica 61 Alumina 16 Iron oxides 5 Alkali earths 7 Alkalis 6
Basic Plagioclase Feldspar	Silica 49 Alumina 18 Iron oxides 9 Alkali earths 19 Alkalis 4	**Gabbro** 1. Gabbro 5. Olivine-Gabbro 3. Norite 4. Olivine-Norite 5. Amphibole Gabbro 6. Anorthosite	**Gabbro-Porphyrite**	**Basalt** 1. Basalt 2. Melaphyr 3. Diabase	Silica 50 Alumina 14 Iron oxides 14 Alkali earths 17 Alkalis 4
No Feldspar With Olivine	Silica 43 Alumina 4 Iron oxides 11 Alkali earths 37 Alkalis 1	**Peridotite**		**Picrite** and Picrite-Porphyrite	
Without Olivine		**Pyroxenite**			

The Smelting of Cobalt Ores.

By Hiram W. Hixon.

*Experience in custom smelting permits me to suggest a system of treating these ores, as is herewith submitted:

1. The ores should be sorted, the metallic silver being separated for direct smelting by cupellation with lead, or melted in crucibles and poured into bars to be sold to refiners.

2. The ore should be ground in a dust-proof ball-mill to such a fineness that it can be accurately sampled.

3. The ground ore should be roasted in a suitable furnace to expel the arsenic and sulphur.

4. The gases from this roaster should pass through a long sheet-iron dust-chamber to cool them and then be passed through a bag-house where all the dust and volatilized arsenic will be recovered.

5. The roasted ore should then be briquetted with a strong bond of red clay and lime-water and dried or frozen, after which it should be smelted in a blast-furnace with about an equal weight of galena or lead concentrate containing about 50 to 60% lead. The necessary iron and lime would have to be added to the charge to produce a slag of the proper composition.

The sulphur for matte-formation would be supplied by the galena, while the arsenic remaining in the ore will form some speiss. The base bullion resulting from this smelting would be sold to lead refiners, or refined to separate the silver.

The matte and speiss will contain all the nickel and cobalt that can be recovered from the first smelting and also some lead and silver. This matte and speiss should be accumulated until sufficient for a special run and then ground in the ball-mill, roasted and smelted separately with more lead to free it from silver. The resulting bullion is sold or refined.

The second matte should be run into a converter, to free it from iron. In the process of converting, the lead, and most of the cobalt, will oxidize at the same time as the iron and go into the converter slag, except that portion of the lead that is volatilized with the remaining arsenic. This will go with the flue-gases and should—for safety—be passed through the bag-house, as they are both poisonous.

The converter slag will, therefore, contain the greater portion of the cobalt as oxide, and, in order to recover, it should be re-smelted in a separate blast-furnace along with a portion of the briquetted flue-dust from the roasting of the ore. The flue-dust highest in arsenic should be used, as the recovery of the cobalt depends upon the formation of a cobalt speiss or arsenide of cobalt. This would be separated from the slag in the same manner as the matte and its further treatment for cobalt would be by chemical methods, after roasting to expel the arsenic, which should be recovered in the bag-house in the manner first described.

The flue-dust containing arsenic would have to be roasted separately to sublime the arsenic, which should be recovered in a separate flue and bag-house provided for that purpose. The arsenic would be marketed as white arsenic, and great precaution would be necessary to provide against poisoning.

By the scheme outlined, the silver would be produced either as silver or in base lead bullion; the nickel would go into high-grade nickel matte containing some cobalt suitable for further refining by the Orford, Mond, or other processes; the cobalt would be produced as cobalt speiss, and the arsenic as white arsenic.

The smelters who buy these ores have not seen fit to give out any information, but the fact that they allow nothing for nickel, cobalt, or arsenic, is significant. To make even an attempt at a partial recovery of each of the metals, is a tedious process and most complicated, from a metallurgical standpoint.

*Abstracted from the *Journal* of the Canadian Mining Institute.

Thawing Dynamite.

Dynamite is one of the things that can not be made fool-proof. In consequence, accidents and injuries from handling it are frequent, the most common cause being ignorance of the best method for thawing frozen dynamite. Every manufacturer of explosives issues periodically a pamphlet describing how this may best be done, the general direction being as follows: Dynamite freezes at 42 to 50° F., and will freeze hard at times when water or moist earth does not freeze at all. When dynamite is completely frozen the cartridge is hard. In this condition it may be impossible to explode it, even with a strong cap, and it surely will not develop full strength. It must be carefully and thoroughly thawed to make sure that it will explode and do good work. The proper thawing of dynamite is a simple operation, and there is no reason why it can not be done safely.

There are a few peculiarities of nitro-glycerine and dynamite that are constantly ignored by many blasters. A dynamite cartridge can be lit with a match and burned without explosion—almost always. It must not be laid against a hot steam-pipe or smoke-stack, or be buried in hot sand, or stood near a fire. Use a heat that can be controlled, and that can never rise above 100°, even when neglected. Dynamite begins to undergo a change at 158° F., and, from that temperature up, becomes more sensitive to shock, until at a temperature of about 356° it will explode simply from the heat. Dynamite is not water-proof, and should not contain over 1% moisture. All over this amount will decrease the explosive power. Dynamite soaked in water for 15 minutes will take up 10% water, which will reduce its explosive force by half, and may make it non-explosive.

The best thawer for dynamite is one in which the cartridges are inserted in tubes that are completely surrounded by hot water. The sticks may be carried to the work in this thawer. Never place the thawer over a fire, or try to heat the water while there is dynamite in it. For thawing on a large scale a building heated with a steam or water coil is good, provided primers, men, and tools are kept out.

Reaction for Nickel.—The test depends on the formation of nickel-dicyanodiamidine $Ni(C_2H_5ON_4)_22H_2O$, which is a very slightly soluble, yellow precipitate of stellate-grouped needles. It is less soluble in ammonia than in water, and is not decomposed by boiling with potassium hydroxide solution. Potassium cyanide dissolves it readily. To apply the test, a 5% solution of dicyandiamide is boiled for a minute with a few drops of hydrochloric acid; the nickel solution is added, and then an excess of potassium hydroxide solution. In very dilute solutions the precipitate only comes down after long standing. The presence of a large excess of cobalt does not interfere with the reaction.

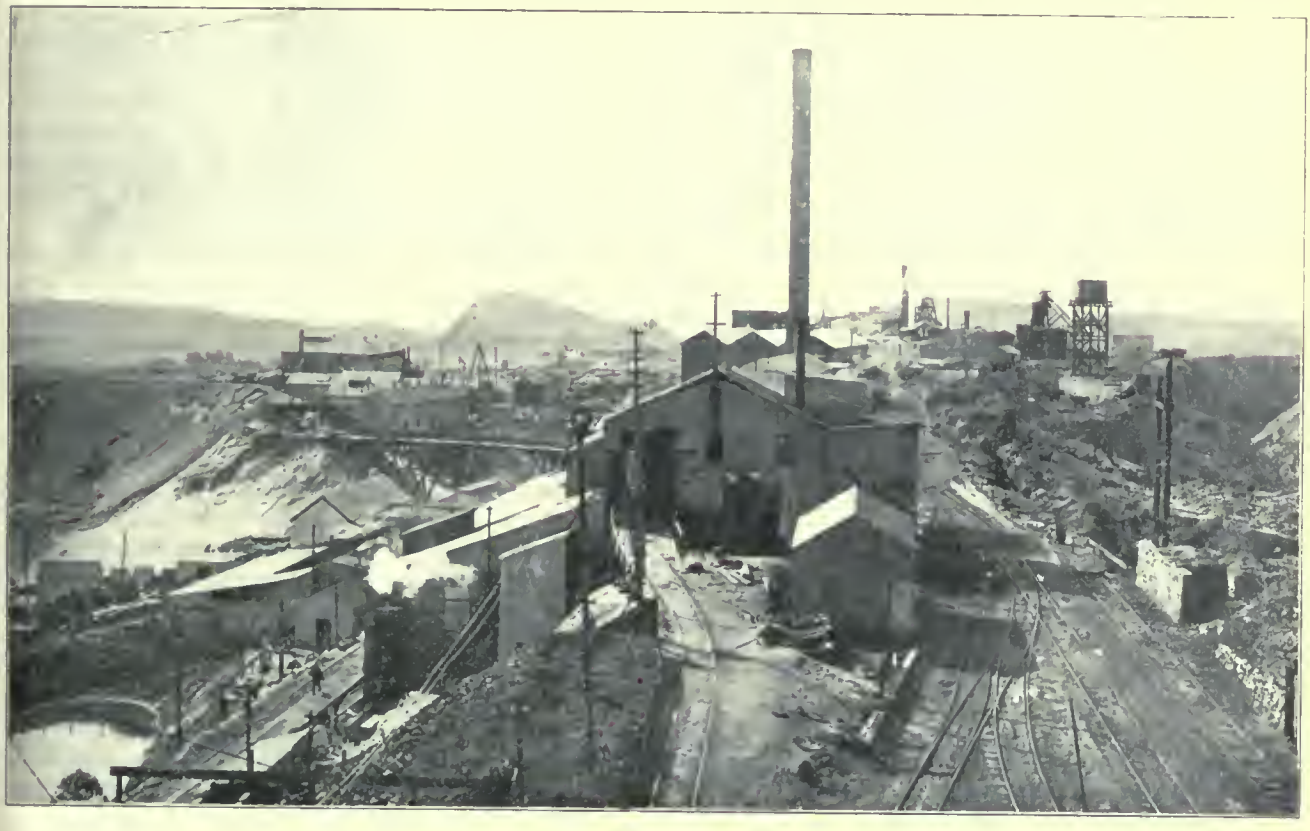
Nuggets.—The largest gold nugget ever found was the Welcome Stranger at Moliagul, in Victoria, in 1869. It weighed 2,520 oz. and was found at a depth of three inches. The Welcome nugget, found at Ballarat, in 1853, weighed 2,195 oz. and was discovered 180 ft. below the surface. Recently at Tarnagulla, also in Victoria, four nuggets, weighing 963, 675, 502, and 372 oz. respectively, have been secured in gravel at a depth of only 20 inches.

Ore Treatment at the Broken Hill Proprietary Mine.

By G. D. DELPRAT.

*The treatment of the Broken Hill ores has undergone many changes during the last ten years, and it may be of interest to some of our members to know what are the main lines on which the Proprietary mine works at present. It must be understood that the want of uniformity in the treatment among the various mines at the Barrier does not prove that some of the mines are working on wrong lines, for the ore is not exactly the same along the whole line of lode; this necessitates a variation in treatment, although generally only in detail.

At the Proprietary mine the ore is all mined by contract; the miners are paid so much per ton for clean ore.



The Broken Hill Proprietary Mine, New South Wales.

The ore in the mine in most stopes is mixed with gangue, and the inclination of the miners is, of course, to mix gangue with the ore, so as to be paid for as large a tonnage as possible. This is quite natural. Clean ore is easily distinguishable from clean gangue, but most lumps are a mixture of clean ore and gangue in varying proportions. The miner will naturally throw into his heap pieces which he considers still good enough, while the management may consider these pieces just a trifle too poor; consequently a check must be kept on this.

This necessitates the first operation to which the ore is submitted. The trucks (tare 5¼ cwt., average load 21 cwt.), as they are loaded underground, have a ticket attached showing to which contract they belong; on arrival at the top of the shaft they are passed over a weigh-bridge; the weight is entered in a book against the corresponding contract by the company's weigher, checked by a check-weigher appointed and paid by the men; this arrangement avoids all disputes. As the trucks leave the weigh-bridge, one is selected haphazard, tipped on a short inclined plate, where the ore lies in full view. A special man, called an 'ore inspector,' sorts this truck-load; he separates the waste from the ore; the ore is then allowed to fall through a chute into the same truck, which is raised by a hydraulic lift to the original level, and, after being re-weighed, rejoins the other trucks on their ordinary course to the mill; the result of the second weighing is that which is booked to the party. As soon as this truck is done with, another is taken, and so on. Generally, one out of every 40 trucks is taken and thus examined. If it is found that any party of men continually load waste into the trucks, such party is called to account; but this is seldom necessary.

On leaving the weigh-bridge, the trucks are hitched to an endless traveling steel rope, §-in. diam.; the distance of the trucks from one another on this rope is about 40 ft. The rope takes them to the tipping cradles, but before reaching these cradles they are automatically disengaged from the rope.

As there is a fall from the brace to the tipping cradles of about 9 ft. in a distance of 360 ft., there is very little motive power required to keep the rope in motion; in fact, when the work is fairly regular, so that an equal number of fulls are on the down-grade as there are empties on the up-grade, no power is required at all; power is practically only required on account of want of absolute uniformity in the work. The largest number of trucks disposed of in this manner for one shift of eight hours is 1,636, but the average per shift is 1,000.

The tipping cradles are placed above the ore-bins. The ore falls over grizzlies of tapered manganese steel. The life of these steel bars is about 12 months. The ore-bins hold about 800 tons and command five Gates crushers, No. 5, having openings of 10 by 30 in. in the spider. The crushers break the ore to 2-in. pieces. The cast-iron cones of these Gates breakers are covered with a removable mantle of toughened steel, and the outside shell of mortar is lined with manganese steel. It is found that, if the liners and mantles were both of manganese steel, the surfaces would wear too smooth, and the ore would not be gripped properly; one requires to be soft for grip-

*Abstract from an address by the president of the Australasian Institute of Mining Engineers at the Adelaide meeting. Mr. Delprat is general manager for the Broken Hill Proprietary Company.

ping, and the other hard for crushing. The life of the mantles is about 1,350 hours, and that of the manganese steel liners 2,700 hours. Many other combinations were tried, such as cast-iron with steel, and different kinds of steel, but the above gave the most economical results.

The crushed ore and the smalls then pass together into bins, which in their turn discharge into one-ton trucks. These are raised, two at a time, by means of a hydraulic lift to the original level on the top bins. The hydraulic elevator has two crushers on one side and three on the other, and the whole of this crushing plant stands between the two concentrating mills. When the trucks with crushed ore and smalls reach the top level they are alternately sent to the right and to the left — that is, to the one mill or the other — each mill having a capacity of about 6,000 tons of ore per six working days.

The new mill, which is the most up-to-date, will now be described: The broken ore is tipped from the trucks into bins, which command a set of three fast-running rolls 36 in. diam., 15 in. wide, ⅜ to ½ in. apart, with steel shells, and making 37 rev. per min. It is found that the shells which answer the purpose best are those of toughened steel; the thickness of these shells is 4⅛ in., and the life, taken over a good many shells, is approximately 3,000 hours. The shells are not turned up, but their surface kept smooth by shifting them sideways occasionally, so that the relative position of the shells opposite one another is not always the same.

The sampling of the ore going to the mill is done on the passage from the bins to the crushing rolls; a man goes around every hour and takes a scoop sample from the chutes that lead into the crushers; a sample is made up for every eight-hour shift; the total weight taken during the eight hours is 700 lb. approximately. This sample goes to the sample mill, which is arranged on the usual pattern, that is, the ore is crushed fine and mechanically divided and subdivided until a sample is obtained not too large for the assay office. A doubt arose whether or not the sample thus taken must be considered a fair sample. In order to test this, another man was put on to take an independent duplicate sample. As mentioned, the usual sample was taken every hour; the new man also took a sample every hour, but half an hour after the first man. The second sample was treated separately in the same way as the first sample. The first sample might represent samples taken at the hours of 8, 9, 10, 11, and so on; the second sample would therefore be taken at 8:30, 9:30, 10:30, etc. This was done for a period of six weeks; at the end of the six weeks it was found that the first sample assayed 16.46% Pb, and the second 16.57%, showing that the method of taking the samples was fairly reliable.

The ore (1½ to 2 in. in size) is fed automatically into the rolls by means of a roll feeder, assisted by a jet of water. On leaving the rolls, it passes over a rocking screen with 3/32-in. holes. The through ore goes to the concentrating plant, and the oversize falls on a traveling Balata belt, which discharges into the boot of an elevator, which elevator returns it to the original top level, and discharges into a second set of bins commanding a second set of three rolls, similar to the first set, but grinding finer and revolving at greater speed, making 45 rev. per min., and ⅛ to 3/16 in. apart. Here again the ore is fed automatically and follows the same process; that is, the through ore goes to the concentrating departments, and the oversize falls on a traveling belt similar to the previous one, and is again raised to the original level and discharged into a third bin. The third bin commands another set of rolls in the same way, which rotate at 78 rev. per min., and 1/16 in. apart; the oversize is raised in the same way into a bin, and from here into the last crusher, which is a No. 5 Krupp ball-mill, specially constructed for wet grinding; in this last mill the grinding reaches finality, as no ore can escape the ball-mill before it is crushed to a sufficient fineness to pass the screens.

From the description it will be clear that material that has once passed a set of rolls never comes back to the same rolls, but goes on to another set adjusted differently. This is one of the differences between the old mill and the new one. In the old mill the usual method is followed of returning the oversize of screens to the same set of rolls. The advantages of the new methods are, in the first place, that a much smaller proportion of slime is made, and in the second place that the gradual reduction effects at the same time a gradual concentration. That is to say, that the material fed into the first set of rolls is the richest. After crushing and screening, the oversize which goes to the second set of rolls is poorer, as the portion not crushed fine enough to pass the screen is the hardest, and therefore contains most of the gangue. The same selection takes place in the second set of rolls, and so on. The assay value of the feed into the first set of rolls is about 15% Pb, while the feed into the last set of rolls or ball-mill is only about 10%. It is found that this automatic selection gives an advantage in the working of the jigs and in the recovery.

The principle of never returning any ore to a machine through which it has once passed, but passing it on to another machine differently set, has been carried out as far as possible all through the mill. It seems right to conclude that a machine which allows material to go through without effecting its purpose should not be called upon once more to do it; the operation should be done in one differently set.

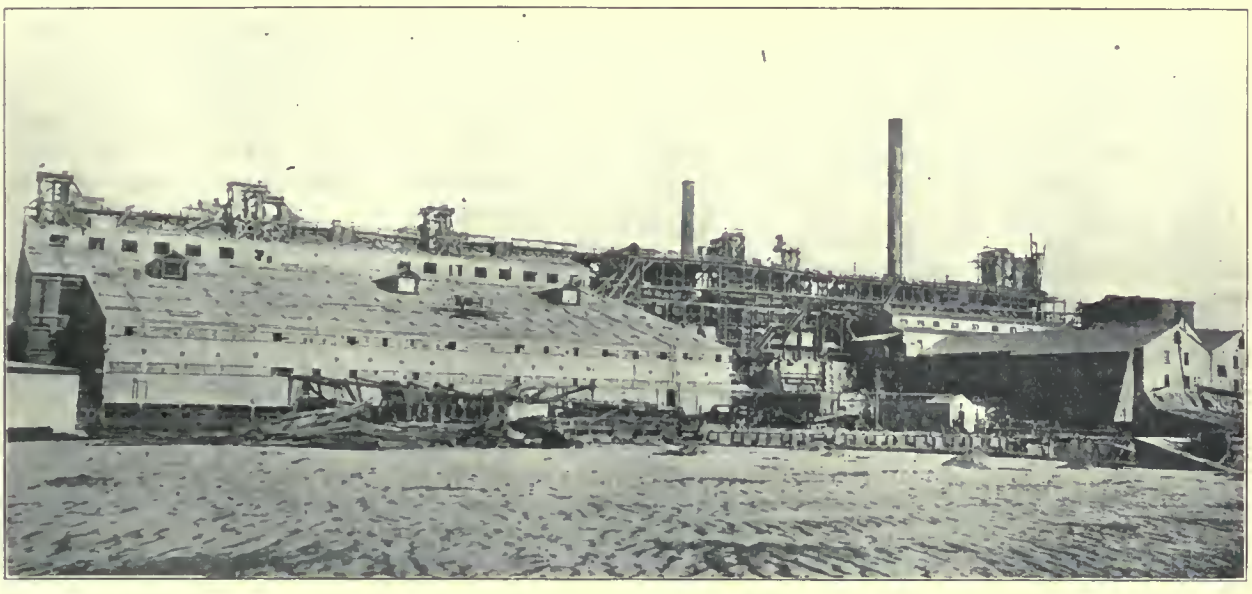
Instead of shaking screens, trommels were used at first, but it was found on experimenting with shaking screens that these did much more effective work than the trommels. The trommels only passed through 58% of the material that was fine enough to go through, while the shaking screen passed through 70%. Other advantages of the shaking screen over a trommel are:

1. Less initial cost.
2. Less water required for screening.
3. Repairs can be made so much more quickly, as it only takes about ten minutes to replace a screen plate, while in a trommel it takes hours.
4. The screen-plate lasts longer in the shaker than in the trommel; the screening area of a shaker is 21 sq. ft., and lasts six weeks, while a trommel to do the same work has an area of 54 sq. ft., and only lasts four weeks.
5. The shaking screen takes up much less room than a trommel, and is much more accessible for cleaning while in motion.

The ore is now all fine enough for the coarse jigs—that is to say, it will all pass through a 3/32-in. hole. On its way to the jigs (May plunger jigs with five compartments), the crushed material passes through a slime separator—an inverted cone with an inflow of water at the bottom, and an overflow which carries the water charged with all the slime. The coarse part of the material goes to the jigs, and the overflow slime to the slime department. In the first two compartments of the jigs, a concentrate of about 60% lead is obtained; in the third and fourth compartments a product assaying about 10% lead, 19% zinc, and 10 oz. silver; and in the last compartment tailing assaying from 3 to 4% lead. The discharge from these jigs is through a spigot at the bottom, and is continuous. The concentrate runs through launders into bins above the railway line, where it is drained of water, and when dry enough runs into railway trucks. The tailing is also run into bins, from which it is trucked to the tailing heap. The middle product is discharged into a

No. 4 ball-mill with slotted screens, 1/32-in. slots; the resulting pulp is raised by means of a bucket elevator into the fine jigs of four comparments, but on its way to these jigs it passes through a slime separator similar to the previous one, so as to remove the slime, which again goes to the slime department. The fine jigs make a concentrate assaying 40% lead, 13% zinc, and 22 oz. silver; a middle product assaying about 9% lead, 18% zinc, and 8 oz. silver. The concentrate and tailing are disposed of in the same way as with the coarse jigs, and the middle product passes into another ball-mill with screens with slotted holes 1/15 in. wide, and the resulting pulp is raised up to the slime separator belonging to the fine jigs. No handling of material takes place; every product finds its way automatically to its destination right through the process.

The slime coming from the various slime separators passes into V-shaped boxes, where it is classified into coarse and fine. The coarse goes to Wilfley tables, and the middling from these over a second set of Wilfley tables at a lower level, the concentrate finding its way to the concentrate bins, and the tailing to another set of bins, from which it is removed to the zinc-treatment plant.



The Broken Hill Proprietary Co.'s Mill.

The finer tailing classified into four sizes goes to the Luhrig vanners, upper and lower set, the same as the Wilfley, and the concentrate and tailing are disposed of in the same way.

During the crushing and subsequent grinding a fine slime is formed, which settles with great difficulty in the circulating water, and runs past all the concentrating appliances. This slime contains about 18% lead and 18 oz. silver, and forms a substantial portion of the total ore treated. At one time this slime was allowed to run away mixed with the tailing as untreatable, but now the circu-

Block 10 Mine, Broken Hill.

lating water is settled in a number of large tanks and the resulting slime (about 1,500 tons weekly, or about 12% of the total ore treated), is collected and further treated by means of the sintering process.

The recovery of lead in:

	Per Cent.
Coarse jigs is	7.50
Fine jigs	13.50
Willfley tables	3.15
Luhrig vanners	3.15

The quantity put through:

	Tons.
Coarse jigs, double, per hour, about	5¾
Fine jigs " "	2¾
Willfley tables "	¾
Luhrig vanners, single belt	⅙

From the former operations four products are obtained:

	Pb. %	Zn. %	Ag. oz.
Lead concentrate, averaging	55	10	26
Coarse tailing "	4	12	5
Fine tailing "	5	17	8
Slime "	18	17	17

The total quantity of ore put through the two mills is about 12,000 tons per week.

It will be noticed that sizing the broken ore previous to jigging is not done. At one time it was thought that sizing the ore—as is the practice in most concentrating mills—might be an advantage, but exhaustive trials made in this direction proved that with the Broken Hill ore there was no advantage in doing this. This may be due to the fact that the mixture of ore and gangue is so intimate that before any concentrate can be obtained crushing through a 3/32-in. mesh is necessary, and to size material smaller than this would be a cumbersome operation when dealing with such large quantities. However this may be, sizing did not give any higher recovery, nor was it more economical, and the idea was abandoned. This only refers to Broken Hill ores; other ores which are coarser should, no doubt, be sized previous to jigging.

AN interesting topic of discussion in the engineering world is the revival of the proposal to drive a railway tunnel under the English channel from England to France. The idea is an old one, but for several reasons has never been seriously considered. Now, however, the electric locomotive offers a solution of the problem and makes it practicable to draw trains through a tunnel over 20 miles long, placed under the sea where ventilating shafts cannot be constructed. The plan is one of some magnitude, involving as it does a 20-mile tunnel, with approaches 30 miles long at each end. But there are other engineering undertakings now being carried on which, while different in character, involve a greater amount of work, and the estimated cost of which is much more than that of the Channel tunnel, which, it is expected, would cost only about $30,000,000.

OF MINERALS associated with the native gold, in the mines of Kalgoorlie, Western Australia, tellurides prevail, and among these calaverite and coloradoite (telluride of mercury) are the most common. Pyrite is abundant, but almost always finely divided in contrast to the often massive tellurides. Further accessory minerals are chalcopyrite, blende, galena, pyrargyrite, enargite, lollingite, fluorite, magnetite, rutile, calcite, dolomite, siderite, ankerite, sericite, chlorite, and roscoelite. To these tourmaline and albite should be added.

THE presence of tourmaline, albite, and smaller amounts of magnetite and specularite indicates, I believe, that the veins were formed at great depth below the surface and at comparatively high pressure and temperature. The metasomatic processes active in the veins of Kalgoorlie are almost identical with those characterizing similar deposits elsewhere, for instance, in the California gold belt and at Cripple Creek.—Waldemar Lindgren.

Politics and the Transvaal Mining Industry.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR P. RATHBONE.

Since the first discovery, about twenty years ago, the Witwatersrand goldfield, occupying the comparatively small area of approximately a hundred square miles, has been the centre of more political unrest than any other district in the history of gold mining.

As I have had some personal connection with much of this political trouble, and as at the present time I take keen interest in the future political and industrial development of the Transvaal, I trust that my views on the present political situation will be welcome to some of your readers.

To commence with, I cannot too strongly insist, after a fairly intimate knowledge of the genuine Boer, as represented by such men as Louis Botha, De la Rey, and others, and also of the old 'colonials,' attracted to the Transvaal by the discovery of gold, that whatever else may happen politically in the future history of the country, *Krugerism is dead;* nor will it ever again be possible for an ambitious Hollander like the astute Dr. Leyds, to form out of the Transvaal what at one time was not only possible, but probable, namely, a strong and independent Dutch republic, as a nation of Transvaalers, greater and far more prosperous than Holland itself had ever been.

It was, I am firmly convinced, with the object of realizing this ambitious dream, that both Boer and Hollander fought during the late Boer War. Had Paul Kruger been possessed of a greater intelligence and been of a less stubborn character and at the same time listened more to the progressive Boers, who now form what is known as the Het Volk party of the Transvaal, the Jameson Raid would never have taken place. Even after the Jameson Raid, had Paul Kruger chosen to forgive and forget, and wisely granted a certainly reasonable measure of franchise to those who became naturalized citizens and took the oath of allegiance, his power in the Volksraad would not have been dangerously weakened and he probably would have been living today as the uncrowned King and powerful President of an immense and prosperous Dutch republic in South Africa. Under such conditions, disloyal as it may sound, I believe that the gold-mining industry would today have been in a far more prosperous condition than it now is under British rule.

The reason for this is not far to seek. The prosperity of the Transvaal depends largely on an intimate knowledge of the native and a proper policy in his treatment, and this, in my opinion, is a matter much better understood by the Boer and colonial Dutch and English of long residence, than by a British Government.

Since my return to England from the Transvaal, where I have resided during many of the best years of my life, I am constantly meeting those who seem still to fear that owing to the interference by the present Home Government in economic questions affecting the prosperity of the Transvaal, it may still be possible to so irritate both the Boer and old Colonial, that another rupture will take place. Before, however, this could possibly eventuate, all political parties in England would think and act alike! As to the country even going back to a state of Krugerism, with the most powerful of Het Volk, or Dutch representation, I do not believe it is possible, as there is no one to lead and dominate the old conservative and unintelligent Boer, as Paul Kruger undoubtedly did.

The great power at the present time of the Het Volk, or Dutch party, is that it mainly consists of a people content, like the native element, to reside permanently and make a 'home' in the country that they

can feel to be, and call, "*Our* land," whatever its Government might be. As for the others, they are still practically *uitlanders*, or foreigners, whom Paul Kruger at one time accurately described as those who came to fill their pockets out of the gold mines, and then went elsewhere to spend their money.

A Boer is content to live that simple life which to others accustomed to a higher civilization simply spells misery. The actual cost of living on the Witwatersrand must of necessity always remain comparatively high, since practically everything that makes life worth living, besides the bare necessities, must for a long time to come, be imported from countries 6,000 to 10,000 miles away.

At present, and in any case until there is a much larger population in the Transvaal and South Africa generally, the mining industries, principally confined to gold, coal, and diamonds, will be the only ones that will materially support this enormous continent of South Africa. The prosperity of these industries, as well as of agriculture, absolutely depends upon a plentiful supply of low-waged unskilled labor. Neither the Boer, nor certainly any civilized white European, will ever be willing to enter into competition for the wage that a Kaffir is more than content to receive.

In order that the Boer and the colonial immigrant, or old resident in the country, can even begin to think of cultivating the land and producing food-stuffs within the country, a plentiful supply of unskilled labor that can *compete* with the native on even terms is essential, and how can this be obtained if all of it, and far more than is now obtainable from all sources, is always to be absorbed by the gold mining industry?

Doubtless reduced ocean freightage and railway transport and a big reduction in duties on the necessaries of life, will account for some reduction in the cost of living, but if this only means that it has finally to be put onto the gold mining industry in the form of an increased gold tax, it is merely robbing Peter to pay Paul. It is too late now to talk of shutting down mines and restricting a large portion of the world's gold output and thus throwing South Africa back into barbarism. Towns have arisen and a large population has been attracted by this gold mining industry and the hands of the clock cannot be put back. The world requires an ever increasing amount of gold and at least one-third of it will continue to be supplied by the Witwatersand gold mines for the next 50 years or more.

Under these circumstances it is therefore certain that the future Transvaal legislature, whether composed principally of Boer or Briton, is bound to find some way that will permit of the steady increase in the prosperity of the Transvaal and its gold mining industry. For my own part, I still believe that, in the continued importation for mining purposes only, of strictly indentured Chinese coolies from northern China, lies the only practical solusion of the unskilled labor problem and that finally the mines of the Rand will be entirely worked by them. This would liberate the Kaffirs now working in the mines, and permit of their being employed by the Boers on the agricultural land, and thus gradually make it possible to produce at least some food-stuffs, and so reduce the cost of living as to enable more whites to be employed upon ordinary unskilled mining work. In this manner there would finally grow up a number of immigrants and others that could be included among the permanent population, who look upon the Transvaal as their home.

The forthcoming Transvaal elections will, I believe, result in the formation of a strong Nationalist party with Sir Richard Solomon as its first Premier, and the Boer element included in it will be strong enough to keep Sir Richard, who is credited with being a negrophilet, in check while insisting on a firm and just native policy—such a policy as would, in fact, induce every available and able-bodied Kaffir in the land to work hard and continuously, as all white unskilled labor has to do in other countries where there is competition.

As to the Chinese, I believe, that on the mines after some fencing has taken place between British and Boer politicians, they will continue to be employed under conditions that, despite some juggling with the words 'servile labor,' will not offend even the most sensitive minds.

Under these conditions I look for a period of greatly increased prosperity for the whole of South Africa, during which 'deep level' and 'deep deep-level' companies will be able to start work and produce gold, like the outcrop companies have already done or are doing. In this prosperity other countries will also benefit by the importation of increased amounts of machinery and stores, especially Great Britain, so that even a Liberal and a Radical Government could then afford to look with complacency on the retention of Chinese labor.

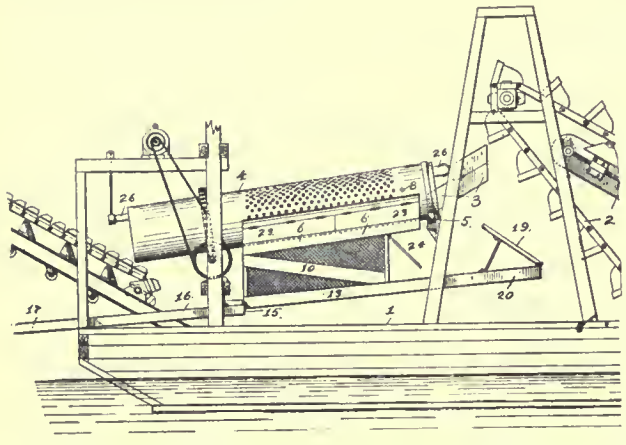
[Mr. Rathbone was formerly Government Mine Inspector in the Transvaal, under the Kruger administration. Since the above was written the elections in the Transvaal have taken place, with the result that the Boers are in control. Sir Richard Solomon stood for election as a Nationalist, of which group only six were elected. Het Volk, the Boer party, has 37 seats in the new Assembly, the Progressive, or British party, 21, the Labor party, three; and the Independents, two. As the Boers form a united party and the others are subdivided, the result has been that General Botha has been asked to form a ministry, of which he is Premier, with other leaders famous in the late war as members of his cabinet. Botha was on the side of reform long before Kruger was defeated, and as he proved an able military leader, he is likely to become a capable leader in Parliament In regard to the Chinese problem, it is probable that further importation will not be permitted, and that the anti-Chinese policy will prevail to the extent of the eventual re-patriation of the coolies.—Editor.]

DETERMINATION OF URANIUM AND VANADIUM.—In the usual method for separating uranium and vanadium, the former is precipitated as alkali or ammonium uranate, but the precipitate is gelatinous, and cannot be washed free from vanadium. The author describes a method in which the uranium is precipitated as ammonium uranyl phosphate. An amount of the substance containing not more than 0.25 gm. of uranium oxide, U_3O_8, is dissolved in sulphuric acid (1 : 5), and the solution evaporated till white fumes appear. After cooling, the solution is diluted, an excess of sodium carbonate added, and the whole boiled until the precipitate settles well. The precipitate is filtered off, washed with hot water, dissolved in the smallest possible quantity of sulphuric acid, the solution diluted, an excess of sodium carbonate added, and the whole again boiled. The precipitate is filtered off and washed, and the combined filtrates and washings are acidified with sulphuric acid. Ammonium phosphate (about 0.5 gm.) is next added, the solution heated to boiling, and made alkaline with ammonia, and, after boiling for a few minutes, the ammonium uranyl phosphate is filtered off, and washed with hot water containing a little ammonium sulphate. In the filtrate the vanadium is determined as usual by acidifying with sulphuric acid, reducing with sulphur dioxide, and titrating with permanganate. The uranium precipitate is dissolved in sulphuric acid, and the uranium determined in the ordinary manner by reducing with zinc and titrating with permanganate.—A. N. Finn, *Journal* Am. Chem. Society.

MINING AND METALLURGICAL PATENTS.

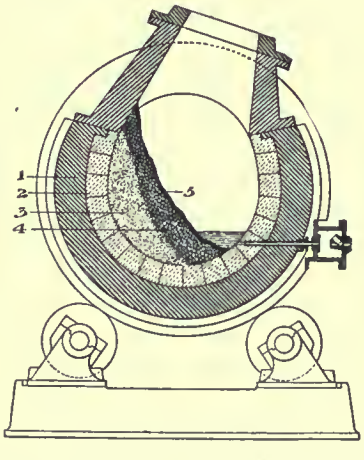
Specially reported for the MINING AND SCIENTIFIC PRESS.

GOLD-SAVING APPARATUS.—No. 846,483; James H. Leggett, Oroville, California.



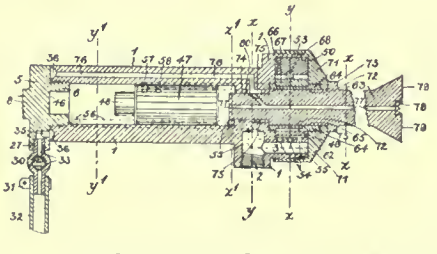
In an apparatus of the character described, the combination of a bucket-ladder and digging buckets, a movable screen for screening the material raised by said buckets, a pan beneath said screen, a grizzly located beneath the upper end of the bucket-ladder and adapted to catch the material discharged from the buckets and not reaching the screen, and a flume beneath the grizzly and connected with the pan beneath the screen.

METHOD OF RECOVERING VALUES FROM FLUE-DUST.—No. 846,818; Ralph Baggaley, Pittsburg, Pennsylvania.



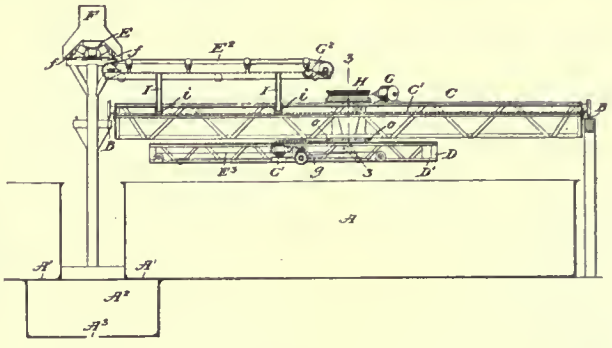
The method of recovering mineral values from finely divided value-bearing material, which consists in placing it in a converter, cementing it therein to the walls of the converter; adding molten matte; blowing air into the matte, and liquefying the dust thereby.

DRILL OR BIT ROTATING MECHANISM FOR ROCK-DRILLING MACHINES OR ENGINES.—No. 845,952; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



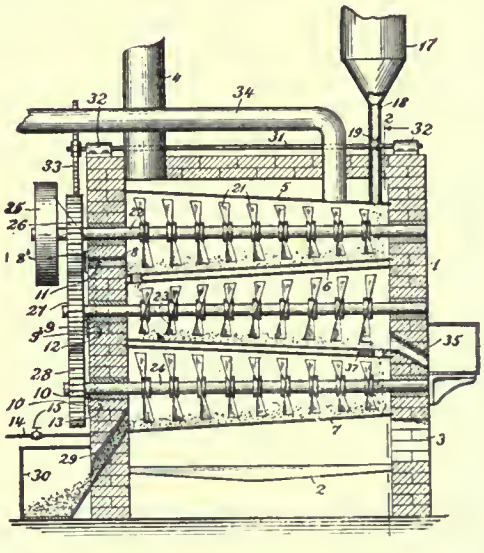
In a drilling or boring machine or engine, a power-cylinder, percussive apparatus within said cylinder, a drill or bit located at the forward end of said cylinder, a motor also located at the forward end of said cylinder, means for engaging said motor with said drill or bit, and means whereby the motor controls the distribution of actuating fluid in the power-cylinder.

DISTRIBUTING DEVICE FOR ORES.—No. 846,792; Joseph E. Kennedy, New York, N. Y., and Francis J. Hobson, Guanajuato, Mexico.



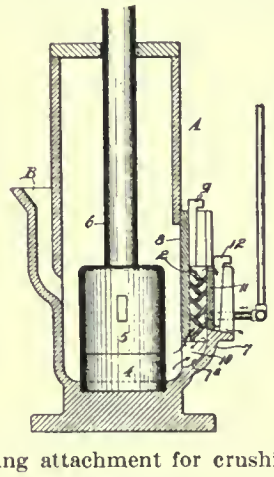
In a device for distributing finely divided material, a transverse beam or truss, a conveyor for carrying material to the centre of the truss; a revolving arm journaled at the centre, a radially moving conveyor carried by the arm for distributing the material, and a communication between the conveyor upon the truss and the distributing means.

PROCESS OF MAKING METALLIC OXIDES.—No. 846,444; John W. Bailey, Jersey City, N. J., assignor, by mesne assignments, to United Lead Company, a Corporation of New Jersey.



The process of making an oxide of a metal, which process consists in reducing the metal to an impalpable metallic powder and then slowly oxidizing the powder by heating it in the presence of an oxidizing agent.

CRUSHING MORTAR AND SEPARATOR.—No. 847,016; Hugh R. Logan, Carson City, Nevada.



An ore-separating attachment for crushing mortars said attachment including opposed series of oppositely inclined plates fixed vertically one above the other and having their lower ends overlapping and separated to form a vertically disposed tortuous channel for the discharge of the crushed material

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

E. A. H. T. sends an augite-biotite Diorite.

A. H. W., of Baker City, Ore., sends a specimen of volcanic Tuff.

The rock from Olalla, Canada, marked J. H. McD., is Diabase containing Pyrite.

The specimens from Temescal, sent by C. J. C., is an Epidote stained rock, of no value.

The specimens from Sheridan, Mont., marked D. G. D., are: No. 1, rock with Graphite scales; No. 2, Calcite; No. 3, Limestone; No. 4, Pyrite.

Specimens from W. L. B., of Manhattan, Nev., are. No. 1, Stibnite in calcite; No. 2, Realgar, the sulphide of arsenic; No. 3, altered Mica-schist.

The mineral from Los Angeles marked N. W. D. is Muscovite Mica. If in large sheets and perfectly transparent it would have a commercial value.

The specimens from Pilare de Nacozari, Sonora, Mex., marked T. N. S., are: No. 1, Feldspar-porphyry; No. 2, Andesite or Basalt; No. 3, Andesite; No. 4, Feldspar-porphyry; No. 5, Andesite; No. 6, Rhyolite; No. 7, serpentinized rock; No. 8, Cerussite, the carbonate of lead; No. 9, Feldspar-porphyry; No. 10, Quartzite; No. 11, Rhyolite; No. 12, altered volcanic, probably Rhyolite; No. 13, silicified Porphyry; No. 14, serpentinized Porphyry; No. 15, silicified Porphyry; No. 16, Andesite or Basalt.

LODE-FORMATION.—E. S. Simpson defined a West Australian 'lode formation' as a more or less vertical zone of rock, usually continuous with the surrounding rock, and of similar origin, but distinct from it in carrying metallic ores disseminated through it in payable quantities, and, as a rule, characterized by strong foliation. Deposits of this nature are probably deep-seated; at Kalgoorlie mining operations have already proved their persistence to 1,500 ft. below the surface. The typical lode formations probably owe their origin to a shearing action having crushed and foliated portions of a rock mass in a certain definite direction, producing a more or less well-defined band of rock through which, by virtue of the foliation, mineral-bearing solutions or vapors can have free circulation. In consequence of this, mineral deposits are formed within the rock, usually, but not necessarily, extending over the whole of the foliated zone, but seldom beyond it, and having no definite boundaries horizontally or vertically other than those determined by the decrease of the assay value of the rock in any one direction to a point at which it ceases to pay the expenses of working. Karl Schmeisser described them as 'composite veins.'

STRUCTURALLY there is great similarity between the gold deposits of Western Australia and the eastern part of the United States—the Appalachian belt. The lenticular shape is characteristic of both as it probably is of all such deposits formed during or before important epochs of dynamo metamorphism. There is a great difference between these veins and the clear cut, straight fissures of the California gold belt, for instance.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

One of two conflicting claimants made application for a patent. Thereupon adverse proceedings were commenced by the other claimant. For the purpose of settling and compromising the action a bond was executed by one party to the other, in which it was agreed that the person executing the bond should proceed as rapidly as possible to obtain a patent, and then to execute and deliver to the other party a deed of a part of the tract particularly described. After a demand and refusal, in an action for specific performance, a deed was executed to the tract described in the bond, giving its boundaries, the number of square feet contained therein, with the following additional clause: "Together with all the mineral therein contained. Together with all the dips, spurs, and angles, and also all the metals, ores, gold and silver-bearing quartz rock and earth therein, and all the rights, privileges, and franchises thereto incident, etc." After the date of the compromise agreement a secondary vein was discovered, which was distinct and separate from the discovery vein, the apex of which was between the compromise ground and the apex of the discovery vein of the person executing the bond. Under these circumstances it was held that the compromise and the deed was an adjustment of all sub-surface rights, and not merely the establishment of a surface boundary line between two conflicting lode-mining claims. In the course of the opinion the Court said: "While the bond made no mention of extra-lateral rights, yet in all probability it would have been held to pass them and the Court may have thought that the single specification 'all the mineral therein contained,' was liable to be construed as narrowing the conveyance so as to include only the mineral beneath the surface, and therefore required that there should be incorporated in the deed the words, 'together with all the dips, spurs,' etc. Yet, in requiring the introduction of these words, which in terms define extra-lateral rights, it also retained the phrase, 'together with all the minerals therein contained.' To the suggestion that giving this construction to the bond and conveyance is in effect the granting of a section of a vein of mineral, the answer is that there is nothing impractical or unnatural in such a conveyance. It does not operate to transfer the vein *in toto*, but simply carves out from the vein the section between the vertical side lines of the ground, and transfers that to the grantee. The title to the balance of the vein remains undisturbed."

Montana Min. Co. *v.* St. Louis Min. Co., 27 Sup. Ct., 254.

The requirement of parallelism of end-lines of lode-mining locations by the Act of 1872 cannot be deemed to apply where the location has been made at the time of the passage of that Act, and the proceedings under the Act of 1866 had then so far advanced as to exclude adverse claimants, in view of the various provisions of the latter Act for the protection of all rights previously acquired under existing laws, and of the provision that prior locators shall have "the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes, and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of said surface locations."

East Central &c. Min. Co. *v.* Central &c. Min. Co., 27 Sup. Ct. 258.

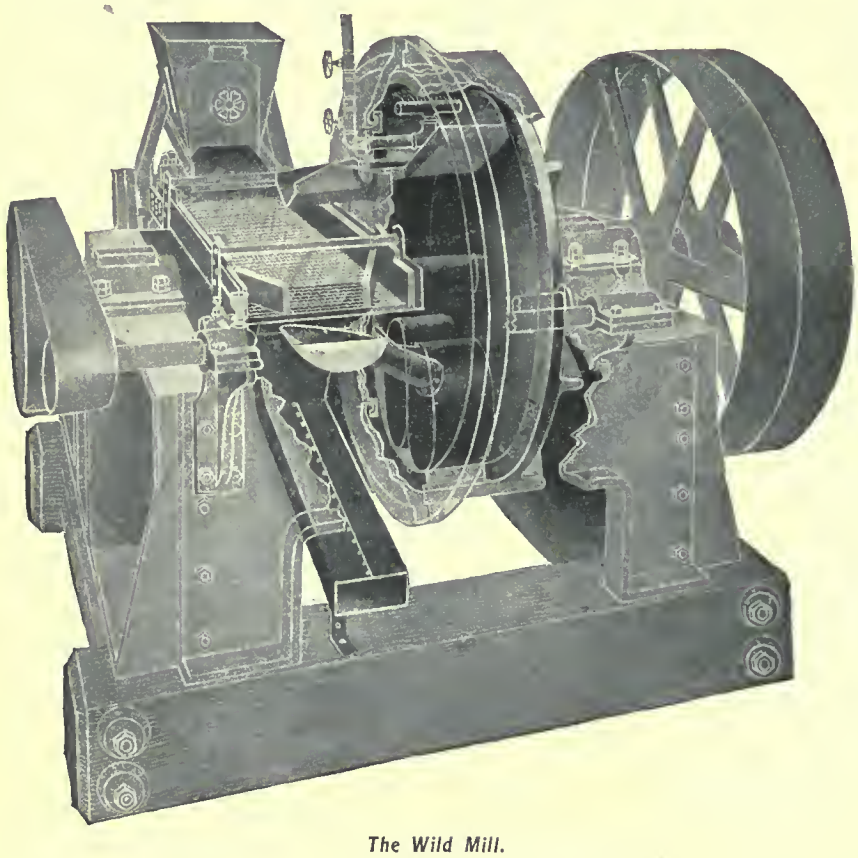
Where a statute required certain duties of a mine operator, without attaching any penalty, or providing any remedy for failure to comply with the statute, it was held that a mine operator was liable in an action at common law to an employee in the mine, injured in consequence of such a violation of the statute, and that such a regulation was valid for the protection of the public welfare and comfort.

Wolf *v.* Smith, (Ala.) 42 So. 824.

The Wild Mill.

It has been recognized for many years that there was need of a device whereby ores could be re-ground for concentration and amalgamation, without the excessive cost incidental to the use of stamps and re-grinding mills. The Morse Bros. Machinery & Supply Co., of Denver, Colorado, have recently designed a re-grinding machine, known as the Wild mill, which they claim will do this work, not only effectually, but at a reduced cost of operation. The machine is simple in construction, there being no complicated or intricate parts to get out of working order, but strong and rigid and capable of withstanding the roughest kind of treatment.

This mill, as will be seen from the illustration, showing the interior of the mill, comprises a feeder, a shaking screen, and a crushing mill combined, conveniently arranged and mounted on one base. The mill proper consists of a heavy revolving bed or ring-die, in which are placed two loose mullers or rollers, which obtain their crushing power from the contact with the revolving ring-die. This die is of



The Wild Mill.

rolled steel and is held in place by wedges. Each of the mullers has steel shells, which are also held with wedges. The action of these mullers is a blow and a grind at the same instant. The admission of the ore to the machine is into a hopper or feeder, which sets at the head of the mill, and is then automatically fed onto the head of a shaking screen. This screen is a Wild shaking screen, the motion of which is a forward and downward thrust, thus screening at each revolution and not permitting the screen to become congested. The undersize passes through, while the oversize passes over the end of the screen and into the spout, where it is then fed to the mill. The ore, after being fed into the spout at the end of the screen, is deposited directly in the path of the mullers and is crushed between these and the ring-die. The wear of the mullers and ring-die is true and smooth; being loose on the ring-die, they do not strike consecutively in the same place, causing them to corrugate, flange, or wear uneven. After the mullers have passed over the ore, the centrifugal motion of the machine carries it to the top of the mill, where a spray of water under 25-lb. pressure is constantly playing against the ring-die, breaking the momentum of the ore, which drops into the hopper and is carried through the spout or outlet, and deposited at the head of the screen It is then screened along with the feed, and that portion of the product which is crushed to the desired fineness at the first operation passes through the screen, together with the undersize of the feed and into the spout below.

By this operation, the machine is only working on that portion of the product that requires further grinding, and is not exerting its efforts in making slime, the quantity of which is reduced to a minimum; at the same time the machine makes a finished product that is as uniform as it is possible to obtain.

The mill does not require an elaborate foundation, but is simply mounted on substantial timbers and securely bolted thereto. The vibration of the machine is slight, its own weight being sufficient to retain it in alignment with the driving pulley on the line-shaft.

Trade Treatises.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., has published an artistic little book on 'Crucibles: Their Care and Use.' The purpose of the book is to instruct users of graphite crucibles as to their proper care, and illustrates the effect of the use and abuse of crucibles by half-tones.

'Leyner Steam and Electric Geared Hoists,' is the title of Bulletin No. 510, sent us by the J. GEORGE LEYNER ENGINEERING WORKS CO., of Denver and Littleton, Colorado.

THE JOSHUA HENDY IRON WORKS, of San Francisco, has issued the following: Bulletin No. 100, describing the Pinder ore concentrator; No. 101, on quartz and gravel stamp-mills, with triple and quadruple-discharge mortars; No. 103, concerning standard ore and water-buckets, and wire rope and safety hooks; and Bulletin No. 105, describing water-gates, reservoir-gates, ball-joints, riveted sheet-steel pipe, pipe-line accessories, and hydraulic data. They are arranged in an attractive form, which is characteristic of all the matter sent out by this firm. This firm has also published a booklet entitled 'Notes on Black Sand-Tests,' by the hydraulic mining machinery department.

Commercial Paragraphs.

THE UNION IRON WORKS has opened a city office at 207 James Flood Bdg., San Francisco.

THE HEWITT MACHINERY CO., 37 Second St., San Francisco, report the sale of a 7 by 10 automatic single-valve Atlas engine to the Leland Stanford Jr. University.

THE AMERICAN SPIRAL PIPE WORKS, of Chicago, have taken over the entire business of the American Forged Steel Flange Company. In addition to a full line of flanges they made for their own pipe, they are now prepared to furnish steel pipe flanges for every class of work.

THE ABNER DOBLE CO., of San Francisco, is pleased to announce that the Appellate Court has affirmed the decision of the Circuit Court, upholding the non-infringement of the Dodd water-wheel bucket, patented June 23, 1891, and afterward assigned to the Pelton Water Wheel Company. About the same time this suit was brought covering the Dodd bucket, a similar suit was brought by the Pelton Water Wheel Co. against the Abner Doble Co., alleging infringement of the water guard used on the impulse wheels of the former. This suit also was dismissed by the Circuit Court, Judge Morrow holding that the Doble centrifugal water guard was not an infringement. This case was not appealed

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Editorial.

ENGINEERS passing through London can obtain this journal from Leathwait & Simmons, at 5 Birchin Lane.

COMMENT ON our metal quotations has reached us frequently since we began to furnish the daily prices. These represent the average of actual transactions at New York on the date given, and they will be found to be trustworthy.

MINERS and managers of mines will find it interesting to read Mr. Whitman Symmes' articles describing how dynamite is made. It may be noted that the tendency is to use ammonium nitrate in the dynamite as a substitute for part of the nitro-glycerine. The manufacturers are feeling their way and testing the receptiveness of the public, which, of course, is not aware of this change in the composition of the explosive. There is no objection to the use of the ammonium nitrate; it gives less flame and is cheaper to manufacture, as it permits of the utilization of the weak nitric acid, formerly a waste product.

TO THOSE engaged in mining in Nevada, the bulletin on Goldfield will be most welcome. We publish a lengthy abstract, together with a map, from this geological report by Mr. F. L. Ransome. It represents the kind of work in which the Geological Survey excels, being a scientific treatment of matters closely related to actual mining, done by a geologist thoroughly versed in the study of ore deposits. In addition to his special knowledge of mining geology, Mr. Ransome is happily possessed of skill as a writer, not too much to render matter subordinate to manner, but enough to make his exposition clear and his description interesting.

TUNNEL SCHEMES are a lure for those ignorant of mining. Men of experience look at them askance. An adit that is planned to drain wet mines, like the Sutro tunnel, or one that is to serve as an artery for a large output of known ores, like the Ontario, the Cowenhoven, or the Yak tunnel, is a sound piece of engineering. But the idea of driving a long cross-cut into the heart of creation to cut lodes discovered at surface has been tried again and again without success. The most insiduous of such schemes is that which is planned to tap veins already worked in mines now abandoned, with the expectation of finding ore richer than that discovered near the surface. If a vein 'peters out' at fifty feet, or if it is poor at a hundred feet, it is neither sound logic nor sensible mining to spend a lot of money in order to tap it at 1,000 feet. Of course, if you make a drawing and represent a number of veins as pro-

ceeding downward uninterruptedly into the bowels of the earth, and then draw a horizontal line to represent the proposed adit, it does look as if you would have lots of mines—on paper. As a matter of fact, this sort of thing is the most illusive of all the imaginations conjured by the glamor of gold. But it serves to bait the circulars of irresponsible promoters. Before us lies a full page illustration taken from a contemporary. It gives a sectional view of a mountain penetrated—on paper—by an adit four miles long, and behind it is a fine panorama of Rocky Mountain scenery, with sunny peaks whose nobility of aspect puts to shame the sordid rot of this scheme to rob people. The 'tunnel' is to be driven—it is only on paper—to prospect at depth a particular portion of Clear Creek county, Colorado, that is least likely to yield rich ore, and that has been prospected at surface a great deal without any notable success. Other parts of the same county have proved richly productive, but in them such a scheme would be less likely to take root, because the mines have been more thoroughly explored, and less is left to the imagination. For after all, it is the imagination that makes the tunnel scheme so attractive to the simpletons in mining, and it is not the constructive imagination of the engineer or the scientist, who builds his mental pictures on facts and ascertained knowledge of the relations between facts, but the imagination of ignorance, soaring like soap bubbles and destined to a collapse as inevitable.

Salting Samples.

FOR ways that are dark the Heathen Chinee is not peculiar; there are others. Some of those ways are illustrated in the selling of mines; for instance, in 'salting.' This ought to be one of the 'lost arts,' but owing to the difficulty of legal conviction it survives through many changes of environment. Thus, this week we heard of a peculiarly elaborate trick. It was a gravel mine, in California, the yield of which was irregular and the value of which was uncertain; nevertheless, each time any engineer sampled it, he got good results by panning. Finally, the mine was sold; a new ditch was constructed and additional equipment was provided, in preparation for systematic work. The first trial proved the ground to be too poor to yield a profit. In the course of investigation, the explanation was discovered. The claim was owned by four brothers; whenever anyone examined the mine, it was the custom to pan the gravel in a side drift near the entrance of the 'tunnel' where there was a flow of water suitable for the purpose. The owners had driven an inclined drift and then walled it, but on the other side of the wall there was found a narrow passage that led to a point exactly above the place for panning; a small hole had been drilled through the 'hard pan' or cement, forming the roof at the spot where the panning was done, and through this one of the brothers had been in the habit of dropping the gold, which fell into the pan as the operator was busily washing the gravel. The particular tool, a short pick, with which the small passage had been dug, was found. There were so many of the brothers that one was never missed, if he occupied himself in the manner described. The others took the unsuspecting visitor through the mine and then stood a respectful distance away from him while he panned, so that the engineer felt positive as to the impossibility of any tampering with his results. Against the elaborations of such a nefarious scheme, there is apparently no defence except the removal of the gravel to a spot at some distance from the mine, to do which is likely to afford other chances for 'salting.' Thus we know of a mining engineer from New York who examined some dredging ground in Alabama, and owing to the lack of water, had his samples carried on a wagon to the nearest stream, getting results that were misleading, for the sufficient reason that all his samples were doctored by the driver of the wagon, at the instance of the owners of the claim. Another example may be quoted. An engineer now so well known that a daily newspaper would label him 'eminent,' examined the Vulture mine in Arizona, and took a number of samples carefully. The assays were satisfactory, almost too uniformly good. His chief arranged for a more detailed sampling before any payment was made to apply on the purchase of the mine, and a staff of samplers was sent to make a systematic examination. In the course of it, the suggestion of something wrong became manifest. A little detective work proved that the samples were being salted; a sack filled with coke was put where it could be tampered with, and the perpetrator was foolish enough not to notice the difference in weight, but enriched the coke with the usual allowance of gold. The salting was done with the gold precipitate from the zinc-boxes of the cyanide mill. An effort was made to get evidence for the prosecution of those responsible, but in this case, as in others, it was possible to convict the tool, but impossible to punish the principals. The moral of this incident is that an engineer should avoid accepting the assistance of men not wholly trustworthy, and never sample a large mine without an assistant of known integrity. As illustrating this point, we quote the story of an examination of the Martin White mine at the old camp of Ward, in Nevada, recently described in this journal. It happened thirty years ago, but the moral of it will apply as well today as then. It was a silver mine, and in the vein there were patches of loose manganese ore rich in silver chloride, affording a crumbly pulverulent stuff eminently adapted to the purpose of salting. An engineer came to examine the mine, and in his work he received the aid of a miner, who broke samples under his direction. The miner wore a coat with big pockets, and in them he had placed several handfuls of the black dust just described. He held some of it in the palm of his hand, and as he struck the vein with a pick he would let a little of the rich stuff drop with the ore detached from the vein. When this scheme did not work, he obtained another opportunity when sacking the sample, a pinch of the 'salt' finding its destination without much trouble. Never sample a mine alone. Write "*Caveat emptor*" on the front of your note-book, and on the back inscribe the proverb, "It is better to be sure than sorry."

By the Way.

Under the heading 'The Parents of Corporations' *The Evening Post*, of New York, comments upon the competition between States in the matter of licensing corporations. It says:

The point which is perhaps least considered in the warfare against corporations is that somebody created each of the pesky things, and turned them loose to plague us. Of course, everybody knows in a general way that some States cater to corporations more than others; but when a Trust exacts another penny, or our ribs are broken in a collision, it scarcely occurs to us to hold responsible the State which chartered the guilty corporation. The monster is so frightful that we forget all about Frankenstein.

The other day the Attorney-General of Kentucky began legal proceedings to secure the payment of a million dollars back taxes from the Southern Pacific Railway. That road at no point comes within three hundred miles of Kentucky. It does not even own property in the State. Yet Kentucky chartered the infant railroad, and expects to reap the benefit now. Nobody can tell from looking at the seal on a company's charter where it intends to do business.

In the *Central Law Journal*, Don Ensminger Mowry gives a brief account of the competition now going on between the States which want this corporation business, at any cost of fairness or self-respect. The familiar, standard corporation law, as he observes, is one in which "five men can sit around a table, put one dollar in the centre, organize a corporation calling for a million dollars' worth of capital, re-pocket the dollar, and go home after sending a certificate of incorporation to the Secretary of State, with a million-dollar enterprise ready to launch." It is from even this strict and hampering regulation that certain States have made concessions with a view to attracting corporations.

The legal press is filled with advertisements encouraging suspicious enterprises to avail themselves of the cheap cost, liberal laws, and freedom from liability which the particular State in question offers. Such conspicuous phrases as: "Incorporate in South Dakota," "The Corporation Laws of the State of Nevada offer the greatest inducements," and "We beat New Jersey," are not uncommon advertisements of our enterprising Western States.

In Delaware, Mr. Mowry's own request for information concerning the incorporation laws was referred by the Secretary of State to a private corporation engaged in the business of 'guaranteeing incorporations' for other concerns. The Secretary of State of South Dakota has given a letter of recommendation to such a concern in his State, saying that the papers it prepares "in all cases comply with the requirements of the statutes of this State."

The industrial promoter in these days stands in the position of the damsel of romance who demands proofs of devotion from her rival suitors. "Come live with me and be my love," cries New Jersey. "I ask of you only a brass name-plate, which you must affix to the front of some building in Jersey City. But one of your directors need reside in the State. You must pretend to have an annual stockholders' meeting here, but you need not come to it, because proxies 'go' to any extent you like. You need not even come over here to get your charter; an agent can secure it for you. And in exchange for these trivial duties and responsibilities I will protect you by avenging on outside corporations doing business here every insult or restriction that their States put upon you."

But New Jersey appears as a laggard in love compared with some of the other gallants. "Accept my name," urges Delaware. "You need not come here even for the annual meeting. You need not keep your records here. You can issue all the bonds you like without paying a cent of tax. Under my charter you can change your mind as often as you want to regarding your line of business. Incorporate a cheese factory, if you like, and if you decide later to turn it into a rolling-mill, or a gold mine, or a trust company—anything in the world except a bank—you have my permission. And besides all these advantages, my charter is the only kind in the country which is absolutely perpetual and unalterable, except at the instance of the party owning the franchise."

West Virginia's sighs are deep, but those young Lochinvars out of the West, Nevada and South Dakota, protest yet louder. Nevada charges no franchise tax. On a capitalization of a million dollars, New Jersey charges $1,000, Delaware $500, West Virginia $410, Nevada nothing. That sounds liberal when corporate purposes are unlimited and stockholders' meetings may be held outside the State. But South Dakota has made a bid favorable enough to get a thousand or more corporations a year away from all competitors. There no tax of any kind is imposed unless the corporation owns property within the State—an extremely unlikely contingency in any of these cases, of course. The entire expense of incorporation, including the maintenance of such an 'office' as the law requires, rarely exceeds $75, while "in nineteen cases out of twenty," on the word of a corporation charter company, "we are able to get the charter into the mails within ten hours after the application is received here." Thus the State which proposes to give up its divorce business, will still have something to fall back upon.

Speaking of similar matters, *The Mining Journal*, at London, says that the amendment to the Companies Acts, now before Parliament, embodies the opinion of the Departmental Committee of last year, that it is desirable to give more liberty to promoters and financiers in the interests of their business and, quite incidentally, of the Government's revenue. The history of the last ten years in company business is that the Government has been trying to raise more revenue from companies, and at the same time to protect the public from foolish or fraudulent finance, and in the result the revenue from stamps has suffered considerably. It has been urged that if the taxation were reduced, and notably the capital registration duty, business would revive, and the revenue would gain in the long run. The Government prefers, however, to keep up its tax, and is attempting to restore business by removing some of the legislative restrictions which at present hamper the company financier. With this end, the prospectus clause is to be modified, and in future information as to amounts of previous issues of shares or debentures, or of the commission paid in respect of them, is only to be required in the case of those made within the two years previous to the prospectus. The same time limit to disclosure is set for payments made to promoters, and it is no longer to be necessary to disclose the names of sub-underwriters. Clauses in the bill which legalize the issue of shares at a discount, and the payment of interest out of capital, are less revolutionary than at first sight they appear. In modern flotations, where the public first comes in at a premium, the insiders have, in the power to issue more shares at a lower premium, the practical equivalent of issuing shares at a discount. The proposed change will give the controlling groups of older companies the same useful power of selling out on the market in anticipation of a new issue when their shares are below par that they now have, so long as any premium remains.

Personal.

C. W. PURINGTON is at Paris.

GEORGE B. LEE is at Butte City.

W. H. WEED is at Morenci, Arizona.

JAMES W. ABBOTT has opened an office at Pioche, Nevada.

POPE YEATMAN was in San Francisco on his way to Los Angeles.

E. H. WEDEKIND is visiting San Francisco from Los Angeles.

CLAUDE T. RICE has left Bisbee, and is now at Los Angeles.

J. R. FINLAY is examining mines near Fredericktown, Missouri.

STRANGMAN HANCOCK has returned to London from the Transvaal.

J. M. CALLOW has returned to Salt Lake City from Telluride, Colorado.

E. MCCORMICK is engaged in professional work at Monterrey, Mexico.

A. W. WARWICK is supervising prospecting operations in Sinaloa, Mexico.

E. A. H. TAYS is engaged in professional work near Guaymas, Mexico.

H. WRIGHTSON, of New York, is visiting San Francisco, on his way to Nevada.

C. V. PETERSON, lately in Honduras, is visiting copper mines in Shasta county.

CHARLES A. CHASE, of the Liberty Bell Mining Co., is visiting California for a rest.

CARLOS W. VAN LAW sailed from Vera Cruz on March 29. He will be in Europe six weeks.

WILLIAM GOWLAND has been elected as president of the Institution of Mining & Metallurgy.

GEORGE A. TWEEDY, of Los Angeles, is superintendent of Minas del Tajo in Sinaloa, Mexico.

W. B. BRETHERTON, chemist for the Great Western Gold Co., at Ingot, Cal., is in San Francisco.

JOHN HAYS HAMMOND has been elected president of the American Institute of Mining Engineers.

CHARLES A. GREEN, of Mill City, Nevada, is visiting San Francisco, to dispose of antimony ore.

WILLIAM CAMPBELL has been promoted to be adjunct professor of metallurgy, in Columbia University.

EDWIN H. DAVISON is superintendent for the Anita Copper Mines Co. at El Cobre, in Sonora, Mexico.

T. C. MARTIN, editor of the *Electrical World*, has been elected president of the Engineers Club, New York.

WILLIAM B. MCKINLAY is serving as an assistant engineer on the work of the Interborough Rapid Transit tunnel in New York City.

J. A. DIGGLES has resigned as superintendent of the Vivian mine, in Western Australia, to become manager of the Broken Hill South.

HOWARD P. SAUNDERS, of Salt Lake City, has returned there from Humboldt county, Nevada, where he has been engaged in professional work.

HILARY BAUERMAN has been awarded the gold medal of the Institution of Mining & Metallurgy, in recognition of services in the advancement of metallurgical science.

W. H. LINNEY has resigned as manager of the Nipissing Mining Co., Ltd., of Cobalt, Ontario. Mr. Linney has been in charge of the operations of the company since its formation.

FREDERICK LESLIE RANSOME has been invalided by reason of an accident to one of his ears. He has been at Oakland for several weeks, and will soon be ready to resume work as an officer of the United States Geological Survey.

Obituary.

EUGENE E. BURLINGAME, a resident of Colorado for 42 years, and one of the best known assayers and chemists in the country, has passed away, after a long illness. Mr. Burlingame learned assaying in New York City, and went to Black Hawk and Central City in 1865, and three years later was appointed to the position of Territorial assayer. When his term expired in 1873 he went to Silver City, N. M., remaining there three years before returning to Denver, where he made his home and established the business which he conducted up to the time of his death.

Dividends.

On April 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 115 of $180,000. This makes the amount of dividends paid since January 1, $720,000, and total to date $8,586,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, April 3.

Argonaut	$4.80	Central Eureka	$0.70
Con. Virginia	1.20	Savage	0.98
Mexican	0.97	Sierra Nevada	0.72
Ophir	2.45	Yellow Jacket	0.75
Belmont	4.50	Midway	1.71
Combination Fraction	4.27	Montana	3.50
Goldfield Con	7.89	Mohawk	15 00
Jim Butler	1.07	Nevada Hills	3.67
Jumbo	3.90	Red Top	4.00
Jumping Jack	0.17	Sandstorm	0.52
Manhattan Con	0.75	Silver Pick	1.22
Manhattan Dexter	0.21	Tonopah Ex	3 75

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
March 29	24¾	6	6¾	66
" 30	24¾	6	6¾	65⅝
" 31	Sunday.	No market.		
April 1	24¾	6	6¾	65½
" 2	24½	6	6¾	65¾
" 3	24½	6	6¾	64¾
" 4	24½	6	6¾	64⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	March 28.	April 4.
	£ s. d.	£ s. d.
Camp Bird	1 4 6	1 4 3
El Oro	1 7 0	1 7 6
Esperanza	2 1 3	2 1 3
Dolores	1 11 3	1 12 6
Oroville Dredging	0 18 0	0 17 6
Stratton's Independence	0 4 0	0 8 6
Tomboy	1 17 6	1 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices	
	March 28.	April 4.
Bingham Central	1½	1⅝
Boston Copper	23⅛	25¼
Calumet & Arizona	160	163
Cumberland Ely	9	9½
Dolores	8¼	8
El Rayo	5	5¼
Guanajuato Con	4⅛	4⅛
Giroux Con	8¼	8½
Greene Con	22⅜	21½
Nevada Con	13⅜	14¼
Nipissing	11⅞	13½
Tennessee Copper	39	40
Tonopah Ex	3½	3½
Tonopah-Belmont	4¼	4¾
Tonopah	16	15½
United Copper	58	59½
Utah Copper	28	30¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

Mining Summary.

ALASKA.

JUNEAU.

The unsettled relations between miners and the operators of the Treadwell mines on Douglas island, have finally culminated in a strike being declared by Union No. 1. The employers refused to meet the men and discuss the differences, so 1,500 men are affected, all but 500 of whom belong to the union. Some threats to use dynamite were made, so a guard was installed on the property, and a detachment of Government troops has arrived from Fort Seward by special steamship.

ARIZONA.

PIMA COUNTY.

The directors of the Helvetia Copper Co. have recently visited the property. The smelter, which is operating at present, will be closed, and all attention will be paid to development work. The shareholders are principally Minneapolis and Boston men, and the company is well backed financially. The Isle Royal shaft, the deepest on the property, is down 900 ft. The company owns a smelter, and a narrow-gauge railroad between the smelter and the mine. ——The Helvetia district is suffering from a shortage of labor. Work on the Tip Top property of the Guggenheims is greatly retarded on this account, and 500 more men could find work in the district. The Tip Top continues to ship to El Paso.——Three tunnels are being run on the Omega property, and about 30 miners are employed in development work.

SANTA CRUZ COUNTY.

The properties of the Mansfield company, in the Wrightson district, are being surveyed for patents.——Development continues at the properties of the National Con. M. Co., on the west side of the Patagonia Mtn., and the showing is improving.

YAVAPAI COUNTY.

A force of 70 men is to be put to work on the property of the Consolidated Greene Co., having claims in the Walnut Grove district, 10 miles southeast of Kirkland, and it is said that the Calumet & Arizona Co. will shortly have a force of 25 men at work on their copper claims just beyond the Wesslich group.——The Neiman mine is yielding $32 gold ore from a two-foot lode at the bottom of the 80-ft. shaft.——Work has been resumed on the Triangle mine, situated three miles west of the Humboldt smelter, in the Big Bug district. The 400-ft. shaft will be sunk deeper, and work will also be done on the 350-ft. level.——The United Verde Extension Co. has installed a new hoist, boiler, and pump on the Little Daisy claim and intends to sink the shaft below the 300-ft. level.

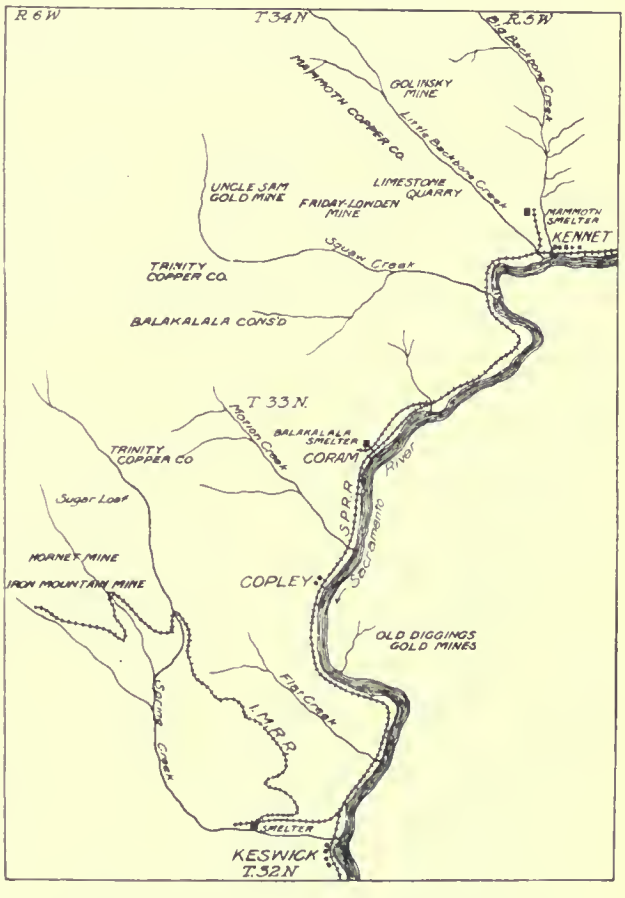
The Mt. Tritle Copper Co. has made its first shipment of ore from the Dunkirk mines to the Humboldt smelter. A contract has been let for hauling five tons per day from the mine to Prescott. The mines are opened by tunnels, and at one time produced gold, but the copper content has increased with depth.

CALIFORNIA.

NEVADA COUNTY.

The recent floods made a great deal of trouble in this county, and caused the suspension of operations in many of the big mines. Now, however, the Alta power line is again in operation; also the De Sabla and Rome plants. Many of the men were laid off, the mills closed down, but now conditions are better and the men are going back to work.——The mill at the Conlan property should shortly be in operation as the building is completed, the concentrators are in place and the other heavy machinery will be hauled to the mill as soon as the roads are passable. The mine is being pumped out after being badly flooded by the recent heavy rains.——The Empire mill was the first to start, since the general shut-down, but the operations were only intermittent, as the power was insufficient for a steady run.——The North Star has a good deal of pumping to do yet, before the mills can start.——Water continues to gain on the pumps at the Sultana mine, as the deep snow on Osborne hill is melting, and no mining can be done in this property for several weeks. Conditions are about the same at the Pennsylvania, which is badly flooded.

Every mine in the Grass Valley district is feeling the effect of shortage of electric power and the heavy flow of water. None of the mines are running full time or with full crews, and more men may be temporarily laid off.——The Jefferson gravel mines at Remington Hill, have been purchased by southern California men, and will be worked by the hydraulic method. The company will erect a large retaining barrier in Steep hollow, and will reconstruct the old ditch and flumes.——The first bar of gold from the Champion and Home mines since the shut-down two years ago has been brought to Grass Valley. Over 100 men are now employed at these mines.——The tunnel of the Giant King, near Washington, is in 300 ft. and has 700 ft. more to go before it will cut the lode. If the vein shows up well, a stamp-mill will be erected. The tunnel will be still farther



Map of the Copper Region in Shasta County, California.

extended, to cut two veins beyond the Giant King. It will be run so as to intersect the Crumbacker vein at a depth of 1,000 ft.——The surface-workers of Grass Valley have become affiliated with the Western Federation of Miners. ——It has become necessary to increase the pumping capacity at the Kenosha mine on Deadman's flat, and Cornish pumps will be purchased.——Smith & Dillon report that their asbestos mine near Washington will be worked. The asbestos occurs in a dike, in a gangue of amphibole.

SHASTA COUNTY.

The Keswick smelter could not start at the proposed time because of washouts preventing the shipments of limestone for flux. However, furnace No. 1 will be blown in very soon, while No. 2 will be held in reserve. Ore from the Iron Mtn. mine will be treated, and it will be at least two months before the branch railroad to the Hornet mine is completed. About 150 men are now employed by the Mountain Copper Co., at Keswick alone, and the whole town is booming.——Old Diggings is suffering from a food famine as the bridges, ferries, and cables have all been destroyed by recent floods, the only cable left being that of the Reid mine, which is used in transporting ore across the Sacramento river.——The Gold Leaf company in the Lower

Springs district, is building a two-mile tram to connect with the Southern Pacific at Middle Creek.——The Mountain Copper Co. has sent out a circular to the quartz miners giving the following schedule of rate on flux shipped to the Keswick smelter: Ore running from $3 to $15, 75% will be returned to the shipper, no smelting charge; from $15 to $25, 77½% will be returned, no smelting charge; from $25 to $200, 90% returned, $3.50 per ton, wet weight, smelting charge. Ninety per cent of the silver is paid for, if assaying over five ounces per ton. Ores running low in silica (below 90%) are subject to an additional smelting charge. All gold is paid for at the rate of $20 per ton, and silver on New York quotations at date of sampling. All ores must be delivered free at the company's works in lots of not less than 10 tons, an additional charge of $3 being made for sampling on all shipments less than 10 tons.

TRINITY COUNTY

The mill at the Bonanza King mine at Trinity Center will start at once. The aerial tramway that was wrecked early in the winter has been repaired, and is now in good working order. Joseph Porter is the superintendent.——The snow has gone from this district, mining activity is reviving, and 25 men are working at the Golden Jubilee on Coffee creek and at the old Nash mine.

The mines of the Trinity Center district are showing activity. Two 5-stamp batteries have been erected on the Golden Jubilee property, and 30 men are employed under William Chapman, the superintendent.——About 15 men are working in the Poverty Slide mine.——The Nash mine, at the head of Coffee creek, 15 miles from Carrville, will soon be worked again. Louis Maitland is the superintendent.

TUOLUMNE COUNTY.

(Special Correspondence).—The new shaft at the Confidence mine is down 370 ft., at which depth drifts are being run north and south.——A flow of water was encountered on the 200-ft. level of the North Star mine last week, which caused a sudden suspension of underground work. A pump was installed, and within a few days development work can be resumed.——Development work is being pushed at the Gem mine, near Sugar Pine.——Officials of the Kanaka G. M. Co. are expected to arrive from London shortly. The purpose of their visit is to inspect the Kanaka mine, near Groveland, and, it is said, to resume operations at the property.——A two-stamp mill will be erected this spring at the Never Sweat mine, situated near Columbia.——The recent inspection of the Black Oak mine, near Soulsbyville, is said to have been made for George Wingfield, a speculator from Nevada.——The Mountain View M. Co., with R. J. Gray as general manager, has been incorporated for the purpose of developing some mining property in the vicinity of Deer Flat.——At the property of the Cocktail Gravel M. Co., situated near Groveland, 300 tons of earth are being worked every 24 hours. No clean-up has yet been made, but the prospects obtained by panning indicate that the owners will be well rewarded.

Tuolumne, April 1.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The advent of spring has resulted in activity throughout the Georgetown district. Many old properties are again to undergo development and the camp is taking on an air of prosperity not witnessed since before the panic of 1893. On Douglas Mtn. the Amanda group of six claims is about to pass over to a syndicate of Eastern capitalists, the price being reported at $20,000. Past development has consisted in driving an adit for 700 ft., but as yet the Amanda vein has not been intersected. According to surveys the objective will be reached within 100 ft. and in view of the fact that a heavy production resulted from shaft workings, important discoveries are almost sure to follow. I. L. McLyman, of Georgetown, is to serve as manager.——The Douglas is showing strong, an 18-in. streak of lead ore having been recently uncovered. Driving is in progress, the ground having been opened for 30 ft. Shipments are to be started within two weeks. Assays show 38 oz. silver and 40% lead.——On Saxon Mtn., the old Morning Glory adit is being driven ahead. This was one of the first tunnel enterprises of the district, work having been first started over 40 years ago. The bore is in 900 ft., a number of veins having been already intersected. Drifts will be run to prove the ground, and it is expected to make shipments in the course of a few weeks.——Work will shortly be resumed on the Magnet group, also situated on Saxon Mtn. These holdings have a record of having produced over $2,000,000 from the shaft workings down to a depth of less than 600 ft.——At Empire, things are on the hum. The Gold Dirt, which has been a steady producer for a great many years, is showing large reserves of high and medium-grade ores. Nelson & Kermode are carrying a stope 300 ft. in length on an eight-foot streak of smelting ore which gives returns of 5.4 oz. gold per ton. A big body of mill dirt is showing, the product being shipped to the mill at Empire for concentration, the finished product bringing $60 per ton in gold.——Arthur Thoman is at work driving a drift on the sixth level of the same mine to cut under the C. C. Wilder shoot on the fifth level. An eight-inch streak is being followed which is worth $80 per ton. The ground being operated by C. C. Wilder is proving to be one of the best paying leases in the district. The orebody measures three feet across, and mill returns bring from 5 to 7 oz. gold per ton.——The Charter-Raton M. Co. is developing its holdings on Breckenridge Mtn. The bore has been advanced for 900 ft., three lodes having been intersected. As soon as the heading has been advanced far enough, driving is to be inaugurated. J. J. Bonner, of Idaho Springs, is general manager.——At the Jewell concentrator on Sherman Mtn., the finished lead product is worth $60 per ton, while the zinc brings $70. The mill is being run on dump-matter from the upper Mendota workings.——The water in the Mendota shaft has been lifted from the four lower levels and sinking is now under way. Contractor John W. Olds expects to complete the 300 ft. within four months. At that time cross-cuts will be run to catch the Mendota vein, when driving will be started.——Heavy shipments are still being made from the Silver Cloud and a handsome revenue is being obtained for the company. A stope 150 ft. long is carried and from 15 to 20 tons are broken daily, the average value of which is 70% lead and from 35 to 40 oz. silver per ton.——The Burleigh Leasing Co. is driving the west Phillips drift from the Burleigh adit. Progress is made at the rate of from five to seven feet per day and within 60 days the heading will reach the objective. At that time a raise is to be put through to make connection with the Seven-Thirty shaft workings. This raise will be 400 ft. but the workings above will be relieved of over 700 ft. of water.——The Strike made by Joseph Ebner in the upper workings on the Seven-Thirty vein is rapidly improving. Weekly shipments are being made and the value of the ore has advanced from $117 to $170 per ton in silver and lead.——John Schuler is stoping on a 10-in. streak of high-grade ore in the Bismark workings. The discovery was made in driving a cross-cut south from the Hercules adit to catch the hanging wall. Recent shipments brought returns of $90 per ton in silver and lead.——Albert Santo, owner of the Big Blue, is driving an adit and following a small streak of carbonates which assays well.——It is understood that the Centennial mine, situated within the corporate limits of Georgetown, is to be sold to a syndicate of Eastern capitalists, the consideration being given at $150,000. This mine is recognized as one of the greatest gold propositions to be found in Clear Creek county, and has a record of having produced $1,000,000. Operations are being carried forward 600 ft. below the level of town, and large reserves of high and medium-grade ore are showing. David Kennedy is the resident manager.——Work has been resumed on the Clyde property, situated on Leavenworth Mtn. The bore, in 500 ft., is to be advanced for a similar distance in order to intersect the lodes lying ahead. At one time the property produced ore of a high grade.——E. J. Butts, the manager, is still running the drift on the Good Hope lode, on Leavenworth Mtn. Some scattered ore is showing and it is believed that a rich pocket of ore is near at hand. Development work is proceeding on the Fred Rogers, operated by Mike Riley under bond and lease. A cross-cut is being run, as it was determined some weeks ago that the early operators lost the vein. In that event it is quite likely that this old

property will shortly be producing again.——Work on the Domino holdings, situated on Payne's peak, is bringing forth good results. Driving is in progress on the Domino lode intersected at a distance of 390 ft. from the portal of the adit and an 18-in. streak of galena is being followed which mills $80 per ton. Harvey Cochran, the manager, expects to install power-drills during the coming summer. An air-line will be run from the East Argentine M. Co. compressor-plant.——The strike made a couple of weeks ago in the Dewey adit in East Argentine is making a marked improvement. The streak now measures over 12 in. in width, with prospects of improvement. Driving is in progress, and as soon as the ground has been opened for 100 ft., stoping will be inaugurated. A. A. Ireland is manager. ——The Mohawk group, near Empire, has been transferred to the Accord M. & M. Co., which is being financed by New York capitalists. Lumber is being delivered on the ground and commodious buildings are now in the course of construction. Machine-drills are to be installed, and power will be furnished by the Two American Sisters M. Co., whose electric wires pass near the portal of the adit. The bore is now in 750 ft., two veins having been intersected. Arthur L. Carr, of Empire, is resident manager.——Another lode has been cut by the Annie May cross-cut on Columbia Mtn. The bore is now in 110 ft. and progress is being made at the rate of two feet per day. E. E. Grubb, the manager, states that a power-plant will be installed during the coming summer.——The Stemwinder still continues to send forth its share of the precious metals. Driving is still in progress from the level started from the 35-ft. shaft sunk from the lower adit, a streak of ore being followed which is 10 in. wide.

Georgetown, March 27.

TELLER COUNTY.

(Special Correspondence).—A corporation called the Cripple Creek Drainage & Tunnel Co. with a capital stock of 1,000,000 shares, par value of $1 per share, has been formed, with nine of the representative mine-owners of the Cripple Creek district acting as directors. This proposed tunnel will lower the water-level of the Cripple Creek district about 750 ft., and its portal is situated on the stream known as Cripple creek, and it is proposed to run it to a point near the El Paso mine, a distance of 15,000 ft., to cut the Beacon Hill water courses. If it is found necessary, it will be extended to a point near the Vindicator mine, a further distance of about 11,000 ft. It is estimated that the first section of about 15,000 ft. will cost in the vicinity of $400,000 and will take from two and one-half to three years to construct. The mines, railroads, and other interested parties have subscribed for a sufficient amount of the capital stock at par to build the first section, and they propose to subscribe for a further amount, if it is found advisable to build the second section. The company is now engaged in constructing buildings and installing machinery and otherwise arranging for active work.

Cripple Creek, April 1.

It has been decided by the management of the Gold Sovereign mine, on Bull hill, to sink the main shaft to a depth of 1,000 ft. The shaft is now down 900 ft., the last 100 ft. having only been recently sunk. Any discoveries of ore at this depth will not only be of great value to the Gold Sovereign mine, but also to adjacent properties, such as the Cresson and Trilby, into which the orebodies might extend. ——Some good-grade ore has been encountered at a depth of 1,500 ft. in the Findley mine on Bull hill. Calaverite shows in many places. This new discovery is of importance, as it has been made at the greatest depth to which tellurides have been found in the camp as far as is known. The output of the Findley mine approximates 100 tons per day, which is shipped to the Golden Cycle mill at Colorado City for treatment.——The compressor for the new drainage tunnel has arrived, and is being unloaded from the cars preparatory to being moved to the tunnel-site at Gatch Park. The machine is from the Chicago Pneumatic Tool Co., will operate 12 drills, and weighs about 15 tons. Owing to the weight of the machine it will be necessary to have the road repaired in places and the bridges strengthened.

Cripple Creek, March 31.

IDAHO.

IDAHO COUNTY.

O. Bosch has sold to George Brown a half interest in the Telephone Girl placer property, on the American river, near Elk City, for $10,000. This gives him control of the entire property, and he will begin operations shortly.——The McKinley company at Lucile is to erect a new mill. The Blue Jacket mines, eight miles from Lucile, are copper properties; 2,200 ft. of shaft and tunnel work has been done. Fifteen men are employed under F. E. Johnesse.——T. A. Simpson, who was sent into the Salmon River country near Lucile by Cœur d'Alene men, has made a strike on recently located properties. The find was made in a cross-cut tunnel, which proved the vein to be 18 ft. wide.

KOOTENAI COUNTY.

The W. K. Mining Co., owning two claims in the Pend d'Oreille district, near Rogers Siding, on the Northern Pacific, is installing a 10-h.p. boiler and pump to keep the shaft clear of water. A 25-ft. vein has been opened. The lode has two shoots, one of which carries zinc of a value of $75 per ton and the other $42 per ton gold.

SHOSHONE COUNTY.

(Special Correspondence).—The Snowstorm Mining Co. has ordered the payment of a three-cent dividend, amounting to $45,000, for March. It is the second dividend this year. It has been decided to pay dividends amounting to three cents per share every quarter. There is plenty of ore in sight to insure that amount for a long time, with a possibility of an occasional extra dividend.——The New Chicago group of two claims on the North Fork, above Pritchard creek, the first quartz location in the Cœur d'Alene district, is soon to be a shipper. The property is owned by Mrs. Eliza Heller and her son, George H. Heller. The mine is equipped with buildings, tracks, and ore-cars, and has been opened to good depth, where showings of carbonate and chloride are exposed. Three hundred tons of ore is sacked on the dump. The wagon-road will be extended to the mine at once, preparatory to making shipments.—— D. C. Hessian, manager for the Bitter Root M. Co., owning two groups of claims near Mullan, announced that his company has let a contract for 250 ft. of work on the tunnel, which is expected to reach the main vein when in a distance of 950 ft. W. T. Penrose, of Spokane, is president of the company, and a number of Spokane men are interested The company has the lode for three-quarters of a mile, and 700 ft. of tunneling has been completed.—— The Federal M. & S. Co. has begun a new prospect-tunnel, which will be run from Government gulch toward Wardner, more than 1,000 ft. There is ground there that has never been prospected by underground work, and it is believed that ore will be found.—— A strike of 10 ft. of copper ore is reported from the Iron Crown mine, near Lookout, east of Mullan. The strike was in No. 2 tunnel, in 800 ft., and at a depth of 300 ft. Albert Massing, John Anderson, and John Swanson are the principal stockholders of the company.—— A strike of galena ore is reported in the Hennessey-Burnes property, southeast of Burke. The ore was encountered by a new tunnel, in 120 ft.—— On the property of the New Hope M. Co., at Osburn, ore was encountered recently at the end of the tunnel, which is now in 700 ft.—— The lower tunnel on the Bull Pine property, on Two Mile creek, near Osburn, has opened a showing of mineralized quartzite impregnated heavily with galena.——The West Hecla Mining Co. has taken over the West Hecla group, consisting of the Bamboo Chief, Ophir, and Ruby claims, for $80,000, of which the first payment of $6,500 has been made. The rest is to be paid in 18 months. Subscriptions of $15,000 have been made to continue the development work. The group is in La Lande mining district, near Burke, and is an extension of the Hecla. A tunnel of 1,500 ft. will be driven with electric drills.

Spokane, April 1.

NEVADA.

NYE COUNTY.

A new find is reported on the Montana Midway Extension mine in Tonopah. A vein was cut at the 630-ft. level, showing two feet of ore. Some think the vein is similar to

the Montana Tonopah orebody, and the strike may prove to be of some importance, although it is very difficult to get reliable information.

ESMERALDA COUNTY.

The labor conditions at Goldfield remain practically unchanged. The Business Men & Mine Owners Association has issued a statement denying that it was formed to combat organized labor or overthrow the Western Federation of Miners. It reiterates that its purpose is to rid the community of the Industrial Workers of the World, and permanently settle the labor and business conditions of the camp. There is no intention of disturbing the present condition of hours and wages. The miners then held a meeting and appointed a committee to confer with the Association with a view to arriving at a settlement.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence).—There is a good deal of activity in the mines of this county. The old Beck mine has started up again, being now known as the National. The ore is silver bearing, with a little gold and occasionally a little copper. One shaft is down 310 ft., a second is 100 ft. deep, and another 60 ft. and there are several prospect shafts. The property is equipped with a good steam-hoist, and a 40-ton concentrating mill is running. About 1,000 ft. of work has been done underground, and the company owns ten claims, close to the Arizona line.——It is reported that the old Volcano mine will be purchased by Eastern men. The property consists of two claims, has a shaft down 300 ft., and is equipped with a 10-stamp mill and amalgamating pans.——At the Granite Gap mine, sinking is in progress, and some ore is shipped to Douglas and El Paso.——The Miser's Chest mine, near Lordsburg, has been bought by Eastern men and work has been resumed.——Most of the ore in this district occurs in contact zones, although some fissure veins are found. The country is badly broken, the evidences of volcanic activity being smoothed by weathering. The country rocks are andesite, granite, rhyolite, and limestone.

Steins, March 30.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Republic, Pearl Consolidated, Quilp, and Ben Hur mines have been leased to Harry L. Rodgers, of Butte, for terms of from three to five years, with options to purchase them upon certain conditions, among which is commencing work in the mines and building a mill about the middle of June, 1907. Mr. Rodgers has a new method of treatment for the dry ores of Republic camp, is confident of success, and expects to treat them for less than $3 per ton. Such success would revolutionize Republic camp.——The adit at the Winnipeg mine is in 835 ft. The foundations for a compressor-plant have been completed. A six-drill Leyner compressor is at the lower terminal of the Belcher Mtn. railway awaiting repairs on that road for delivery at the mine. Rand drills will be used. E. R. Fraser, has succeeded J. L. Harper in the management of the mine.——The Belcher Mtn. railway is now in charge of F. R. McMillan and undergoing alterations and repairs.

Republic, March 30.

STEVENS COUNTY.

(Special Correspondence).—Albert J. Goodell, manager of the smelter at Northport, announces that ores from Le Roi mines, part of which are now smelted at Trail, B. C., will soon be sent to Northport, for treatment. The factional fight has been settled, and hereafter all Le Roi ore will go to Northport. The contract with the Trail smelter is near its end.

W. H. Mead, manager for the Mining and Mammoth Mining companies operating at Metaline, reports that concentrating ore, carrying a high percentage of lead, has been struck. Assays show ore values up to $94 per ton. Ore was struck after the tunnel was driven 115 feet.——A body of ore, carrying gold and copper, has been cut in the lower workings of the Paragon mine near Northport. The ore runs 12% copper. The vein has been opened for five feet, but its extent is not yet determined. It is generally understood that F. Augustus Heinze is the principal owner of the property.

Spokane, April 1.

BRITISH COLUMBIA.

The group of claims belonging to the Spitzee Mines Co. has been leased and bonded by Le Roi Mining Co. A large force of men will be put to work at once on this property, which has already sent several thousand tons to the smelter. This is only another evidence of the tendency in this camp to consolidate properties. Air will be brought from the Black Bear, and A. G. Larson will be the superintendent.—The Nordberg compressor has arrived at the Centre Star, and is being put in place.—— The mines all shipped an increased quantity of ore this week, as the smelters are receiving plenty of coke again, and are running to full capacity.

The following is the tonnage shipped from and crushed at the Rossland mines for the week ending March 23: Centre Star, 2,791; Le Roi, 3,150; Le Roi No. 2, 350; White Bear, 35; White Bear, milled, 500. Total, 6,826. At the Trail smelter during the same week was received 6,446 tons. Besides the ore shipped to Trail from the Rossland mines, other shipments to this plant were as follows: Snowshoe, Phœnix, 565 tons; St. Eugene, Moyie, 336 tons; North Star, East Kootenay, 64 tons; Queen Victoria, Nelson, 45 tons; Sunset, 43 tons; Jessie Bluebird, 25 tons; Lorna Doone, 22 tons; Sally, 20 tons. The supply of coke is steadily increasing. At the Northport smelter, ore is still being received from Le Roi, but in a short time the contract with the Consolidated company will expire, and after that all the ore from Le Roi will go to the Northport smelter.

The shipments of ore from the Boundary mines for the same week were: To Granby smelter, from Granby mines, 13,641 tons; from Emma, 30. To B. C. smelter, from Mother Lode, 4,800 tons; from B. C. mine, 440 tons; from Emma, 100 tons; and from Snowshoe, 920 tons. To Dominion Copper Co.'s smelter, from Brooklyn, 1,954 tons; from Rawhide, 186; from Sunset, 480; from Mt. Rose mine, 70 tons. To Trail smelter, from Snowshoe, 660 tons; Sally, 30 tons; from Riverside, 30 tons. To Nelson smelter, from Emma, 20 tons. The total shipments for three weeks were 25,099 tons. The total shipments for the year to date were 194,503 tons.

This week the Boundary smelters treated ore as follows: Granby smelter, 14,628 tons; B. C. Copper Co.'s smelter, 8,070 tons; Dominion Copper Co.'s smelter, 4,058 tons. Total treatment for the week, 26,756 tons; and for the year to date, 190,036 tons.

NOVA SCOTIA.

(Special Correspondence).—Options on 18 different gold-mining properties in the Leipsigate gold mining district, the Malaga, Whiteburn, Pleasant River, Mill Village, and Brookfield gold mining districts, have been obtained by interests closely identified with the Micmac Gold Mining Co., and also an option on a 10,000-h.p. water-power site on the Mersey river, the purpose being to build an electric power-house, and run electric transmission lines to the different mines and mining properties under option.——If this plan is carried through, it will make it possible to work those properties which could not be worked under the old expensive methods, using steam for power, and coal and wood for fuel, and will give the mining districts in Queens and Lunenburg counties, the biggest mining consolidation in Nova Scotia. It will certainly make the districts of Malaga and Brookfield boom as the Leipsigate district is now doing.——The transmission company that is installing an electric transmission line from the power-house on the Mersey river to the Micmac mines, is erecting spruce and hemlock poles, instead of cedar, using 35-ft. poles, costing a little over $1 each. The cedar poles of the same dimensions would cost the company about $5 each landed on the ground. No. 6 copper wire will be used on the line, and 23,000 volts will be carried. Double apron, fog proof, heavy porcelain insulators will be used.——A great many of the miners who left Nova Scotia to go to Cobalt during the first excitement in that district, are now swarming back, on account of the unusual mining boom going on in this vicinity.

Bridgewater, March 21

Special Correspondence.

London.

Oroville Dredging.—Satisfactory Showing.—Economical Methods.—Mr. Hammon's Report.—Russian Mining.—Dredging in Siberia.—Sanguine Expectations.—Large Areas of Alluvium.—Glittering Generalizations.

The London committee of Oroville Dredging Ltd. has issued a useful report covering the period of 18 months, from the date when the Company began to operate, to January 31, 1907.

The following table is compiled from the general summary contained in the report of the general manager, W. P. Hammon, for the fiscal year ended July 31, 1906:

Number of Dredges	Property.	Ground dredged, cu. yd.	Average depth, ft.	Area dredged, acres	Gold obtained, $	Averages per cu. yd. Yield, Cents	Working Expenses, Cents	Net profit, Cents
3	Boston & California	2,161,981	31.0	43.19	406,769.35	18.81	6.37	12.44
4	Boston & Oroville	1,710,661	30.2	35.14	197,477.52	11.54	6.64	4.90
2	Oroville & Exploration	910,495	27.5	20.46	101,592.98	11.16	4.28	6.88
	Total	4,783,137	30 0	98.79	705,839.83	14.75	6.21	8.54

Of the above-mentioned dredges, 3 Boston & California, and 3 Boston & Oroville, old type, were at work throughout the year; 1 Boston & Oroville, modern type, began work only in May, 1906, and the 2 Oroville Exploration, old type, were at work for seven months, having begun operations on January 1, 1906. During the first six months of the current financial year—August, 1906, to January, 1907—the following dredges were at work: Boston & Oroville property; 2 Risdon, 1 Bucyrus, and 1 Boston Machine Shop (modern) type. Boston & California property; 1 Risdon, 1 Bucyrus, and 1 (old) Boston Machine Shop. These dredges were in operation throughout the six months. On Oroville & Exploration property 1 Risdon and 1 Bucyrus dredge throughout the six months, while the second (modern) Boston Machine Shop dredge started work on this property in October. In the same month work was begun on the Bear River property with 1 Risdon and 1 Boston Machine Shop dredge, the latter being the third modern dredge put into commission by Oroville Dredging Ltd. As the new dredges came into operation, with the increase in output and profit that naturally result, a satisfactory decrease is shown in the costs. Thus the total cost per cubic yard, which averaged 6.21c. during the year ending July 31, 1906, was brought down to an average of 5.19c. during the quarter ending November 30, 1906. Mr. Hammon's remarks on the first new dredge that was installed on the Boston & Oroville property in May, 1906, are noteworthy. He says: "This dredge was designed and built by the Boston Machine Shop Co. Dimensions of hull 100 ft. long, 38 ft. wide, 7 ft. 6 in. deep, contains 200,000 ft. lumber, digs 35 ft. below water-line; the bucket-line contains 66 buckets of seven cubic feet capacity; weight of machinery 646,000 lb.; speed of bucket-line, operating normally, 50 ft. per min., discharging 19 buckets per min. The dredge cost complete, fully equipped for operating, $95,409. This is the first machine of this design we have used, and the result for the first three months is very satisfactory. The ground in which it is operating is extremely hard and compact, and the fact that it has handled an average of 2,506 cu. yd. per day in ground where Dredge No. 2 could not accomplish over 1,000 cu. yd per day demonstrates its decided superiority over the older type machine. A longer period of operation will better determine its cost of operation, but the result so far obtained, of 3.83c. per cu. yd., is remarkable, and I have no hesitation in stating that such a dredge, under normal conditions, as to depths and formation, will handle material at a cost of at most 3c. per cubic yard." Referring to the results for the first fiscal year to July 31, 1906, Mr. Hammon reports: "As a whole, Oroville Dredging Ltd. has made its first score scarcely under average conditions, and, with the addition of three modern dredges, of great capacity, we should increase our yardage fully 50%, and we certainly will increase our output accordingly." And he states in conclusion: "The outlook for the future of our company is good, fully up to our expectations." It will be seen from the following figures that, with the addition of two out of the three modern dredges, during a part only of the six months to January 31, the general manager's anticipation as to increased returns was being realized.

THE LONDON COMMITTEE'S ESTIMATE OF APPROXIMATE PROFITS 18 MONTHS TO JANUARY 31, 1907.

Gross Returns.		Profits.
$ 705,839.83	One year to July 31, 1906, after providing for depreciation of dredges, etc.	$ 555,705.51
4 3,107.98	Six months to January 31, 1907	267,000.00
$1,178,947.81		$822,705 51
	Deduct dividends paid, namely, 5 quarters 12½c. per share to December 29, 1906	420,796.69
	Estimated surplus for reserve fund	$ 01,908.82

The Committee's report states further that a sixth dividend of 12½c. per share has been declared. This is payable at Boston on March 30.

Leading engineers such as Taylor & Sons, Frederick Hatch, T. H. Leggett, C. M. Rolker, are reported to be actively engaged in the investigation of properties, mostly in Siberia, on which options have been secured with a view to the formation of companies, some of which have a large working capital for development of concessions, extending over many thousand square miles, generally described as "auriferous territory." Numbers of Englishmen and Russians are found exchanging visits to each other's capitals in quest of concessions on the one hand and financiers on the other. As a result a good deal of money is beginning to flow from and through London to Russia. One of the newly formed companies—Central Siberia Ltd.—has been spreading its glittering wares before the public at the first (statutory) meeting under the presidency of the Marquess of Winchester, chairman of the company. Referring to the properties in the Yeniseisk district, the chairman reminded the stockholders that Mr. Maund (the managing director) and Mr. Mercer, (the consulting engineer) had made a careful examination of those properties during the last summer and autumn. The board had since then had the advantage of consulting with Mr. Vostrotin, from whom options over many of the properties in the Yeniseisk district had been obtained, and they had learnt from him that over 17,250,000 oz. gold had been taken out by pick and shovel alone in the past in that district, so that it was no untried proposition, but really a going concern that has been successfully carried on in the past by primitive methods, and which, by the introduction of modern machinery, should be more highly remunerative. It is expected that the first profits will be realized from the Kalami river group. A dredge of approved English make has been secured, capable of dealing with 1,500 cu. yd. of wash per diem, and a contract has been entered into that will ensure the commencement of gold-dredging operations in August next. The Company's engineer is shortly leaving for Siberia with a dredge-master, who has had experience in New Zealand and elsewhere, and a competent staff to superintend the erection and working of the dredge. The chairman gave the engineer's views

on the profits which he anticipates they are likely to derive from the working of the Alexandrofski group by dredging, in the place of the old hand-work. He states that, taking the total dredgable contents of the Alexandrofski property—one of the group where they are starting operations, and where the investigations were conducted last year—at 8,000,000 cu. yd., having an average value of 1s. 8¾d. per cu. yd.; the total recoverable value is £691,666, but, by the subsequent acquisition of adjoining properties, the total dredgable length on the Kalami river is alone increased to 10 miles, giving a total dredgable contents of 26,000,000 cu. yd. Valuing this at no more than 1s. 6d. per cu. yd., the total gold value is £1,980,000, recoverable at a cost of £742,500, leaving an ultimate net profit of £1,237,500, and this after allowing 6¾d. for working costs; this liberal estimate having been arrived at in view of the extra work entailed in the removal of boulders found in the turf.

Turning to the Timofeesky property, which has produced in the past, from a portion of the area worked, 15,800 oz. gold, situated on the river Vangash, in the North Taigah district, the engineer states that on this property the wash is about 16 ft. thick, with an overburden 8 ft. thick, and he considers it will be fair to take the value throughout at 1s. 2d. per cu. yd. The total dredgable ground is estimated at 7,300,000 cu. yd., having a total value of £426,344, recoverable at a cost of £152,344, leaving a profit of £274,000. On the subject of the vein-mining properties, the chairman explained that this branch of the industry in this district had been entirely neglected in the past, owing to the ease with which the alluvial gold was won, and to the utter ignorance as to how to deal with quartz propositions. In the opinion of the engineers and geologists, the gold found in such abundance in the alluvial deposits has been derived by the denudation of quartz veins. As evidence of this, the boulder of quartz before the meeting seamed throughout with gold, was brought by the expedition from a river in the company's district. From the veins, to some extent prospected by them, the Pervenetz, which is situated close to the alluvial properties, claimed attention. This vein has been merely exposed on the sides of the hill; but it can be rapidly developed at a minimum expenditure. The engineer states that the vein is about three feet wide, and that samples gave the satisfactory result of nearly 19 dwt. per ton. Arrangements have been made to erect a small stamp-battery on this property. Another vein, the Gerassimo, was first visited by Mr. Mercer some 17 years ago, and has already been subjected to a certain amount of development. Its past history has shown that, notwithstanding the crudest methods of work and management, it has produced no inconsiderable amount of gold. Investigations undertaken by the Government upon work done as far back as 1890 give assays as high as 2½ oz. per ton, with an average of 14 dwt. Taking into consideration the facilities for working and the great size of the lode, it is estimated that ore of no higher value than 8 dwt. per ton will yield a profit of 12s. per ton when everything is equipped and organized. In summarizing the whole of the Company's holdings in the Yeniseisk district, it was found that the total dredging area in the North Taigah is 7,669 acres and in the South Taigah 1,225 acres, or a total of 8,894 acres. The figures and values for the Alexandrovski, or Kalami group, and for the Timofeesky, show that nine dredges working on these two properties would give an aggregate profit of £75,000 per annum, with an average life of from 15 to 20 years. Much has been said about the climatic difficulties in Siberia; but it has at least the advantage of being extremely healthy, and as regards quartz mining, it can certainly be carried on all the year round, while dredging in the North and South Taigah, where there is actually no permanently frozen ground, can be usually carried on for an average of 155 days. The managing director, Mr. Edward A. Maund (of South African mining fame) in addressing the meeting said he wished to emphasize the fact that they were the holders of 57 mines in the Yeniseisk district. He then spoke of the important interests of the Company in the Transbaikal district, and wound up an eloquent speech by reminding his audience that Russians could afford "to forget outlets in the Indian Ocean, the Far East, or Mediterranean, for Russia possesses within its own frontiers all the riches not owned by other nations. Russia has no need—like other nations—to go across the seas to found colonies." This was a solid fact, brought home to anyone who knows Canada and British Columbia and has seen Siberia. "She has, in fact," said Mr. Maund, "Australias, South Africas, Canadas, and Klondykes within those frontiers. It is well that this company obtained a share of Siberian riches while the welcoming hand was extended alike by the Government and a thoroughly hospitable and friendly people."

Spokane, Washington.

Copper Mining in the Coeur d'Alene.—The Snowstorm Mine.—Other Promising Copper Prospects.—Two Classes of Ore.—Metallurgical Treatment.—A Copper Smelter Likely to be Built.—Canadian Coke.

In the past the Cœur d'Alene district of Idaho has been chiefly noted for its large production of lead ore, but in the future the tonnage of copper ore promises to become an important factor. The success achieved by one mine, the Snowstorm, three miles east of Mullan, has directed a large amount of attention to the possibilities in this direction. From one mile east of Mullan to 15 miles east, the ore-bearing quartzite, instead of maintaining the usual lead production, is copper-bearing, with a distinct dividing line between the classes of copper mineral as adapted to smelting. For simplicity, the Northern Pacific railroad may be taken as this dividing line. North of the railroad, the ores are silicious, running 90 to 95% free silica. The main shipping product of the Snowstorm and also of the other prospects, down to 750-ft. depth, is a copper carbonate, running from 3.75 to 8% copper, on the average. Below 750 ft. the ore changes to a highly silicious chalcocite, with some bornite and chalcopyrite. In a smelting sense, the ore can be classed as silicious all through. With greater depth in the Snowstorm, the percentage of sulphides appears to increase, both in amount and in the size of the particles, but concentration may be said to be not feasible, as long as a market can be found for the ore by mining and shipping the vein in its entirety. The expense of the plant required, coupled with the losses in ore-dressing, would outweigh the benefit derived from the saving in freight charges on the waste-matter shipped. The ore is chiefly useful for converter-lining, due to its low iron and high silica contents, which fact must also be taken into consideration in the treatment rates quoted, as against the saving in freight. There is every indication that, with depth, the prospects under development on the north side of the railway will be of the same nature as the Snowstorm. The market for this class of material is a limited one, wherefore, should other mines reach the shipping stage, these would become active competitors.

South of the Northern Pacific railroad, and directly opposite the north side, the character of the ore changes into the sulphides, chalcocite, with large particles easily treated in ore-dressing, chalcopyrite, and bornite also in the same class. The accompanying minerals are siderite and iron pyrite. The matrix is a quartzite with small

veinlets of quartz. As a concentrating mixture, it is fairly good, and there should be little difficulty in arranging a flow-sheet that will throw the major part of the ore-dressing onto machines of large capacity, such as the Hancock jig. The water supply is excellent; electric power is available and cheap. Chalcopyrite predominates as the copper producer; the mineral is fairly hard, and will resist the abrasion so productive of slime in machines of great capacity. No zinc or barite is encountered. The properties are as yet in a preliminary stage of development, but a number are being worked in a vigorous manner, and the indications to date show that the orebodies are of large size, they can be mined and transported cheaply, and sampling indicates that they will easily average two per cent copper in the mill-feed.

The only mineral that remains an uncertain factor is the siderite. This occurs in considerable quantity, and the closeness in specific gravity to the pyrite and copper

The Coeur d'Alene, Idaho.

sulphides renders this mineral difficult to remove in concentration. The admixture of the siderite in copper smelting is not wholly a desirable feature, due to the evolution of the carbon dioxide, which tends to extinguish the flame in the copper furnace. This phase of the problem should not present any great difficulty. It might necessitate roasting, but the ore would be rich enough to stand this extra expense.

The operators on the north side fully realize the gravity of the situation with relation to the silicious product. It is to a large extent their capital that is developing the south side properties. With the proving of the latter, the next step will be the establishment of a smelting industry, situated at some favorable point. Iron is abundant, fuel can be procured cheaply from the Canadian side, at no greater cost to the plant than that furnished by the Utah and Colorado plants, and probably as cheaply as that now received by the Anaconda and Great Falls smelters. Limestone of good quality exists contiguous to the Cœur d'Alene district. Abundant water and power, rail competition, and labor are within touch. Every indication points to the establishment of a large metallurgical industry.

As for ore supply, the Snowstorm alone is capable of furnishing up to 750 tons of silicious ore per day. Other properties on the north side are likely to become shippers within a year. The necessities of the silicious tonnage bid fair to force the development of the south side sulphide belts. A copper smelting industry is fairly in sight for the Cœur d'Alene, which will vastly increase the importance and scope of operations in this magnificent mining region.

Salt Lake, Utah.

Utah Consolidated Earnings. — News From Bingham. — The Tintic Smelter. — Ore Shipments. — Deep Creek District. — Smelter Sites.—The Ontario Adit.—Utah Copper Co.'s Mill.

An extract from the annual report of the Utah Consolidated Mining Co. shows the earnings of the Bingham mine belonging to this corporation during 1906 to have been $9.45 per share net, on a production of 18,500,000 lb. copper. During the year 296,989 tons of ore underwent treatment, yielding aside from the copper, 457,812 oz. silver, and 42,601 oz. gold. The net profits were $2,835,009, against $1,887,385 recorded for the previous year. The amount of sulphide ore in sight is reported to be about the same as twelve months ago. A total of 10,172 ft. of exploratory work was performed, 2,725 ft. of which was in ore. This development was done largely on the upper levels.

A suit has been filed in the District Court by Richard F. Smith against the Bingham Group Mining Co. and others to quiet title to the Crœsus claim at Bingham. It is alleged in the complaint that defendants have attempted to place a mortgage on the property for $30,500, thereby clouding the title. Damages to the amount of $5,000 are demanded. At a special meeting of shareholders of the Bingham Standard Copper Co., a bond issue of $125,000 was authorized. A resolution was also passed sanctioning the action of the directors in bringing about a plan of consolidation with the Bingham Central Mining Co. The Consolidated corporation will own over 500 acres of ground.

It is expected that excavations for the lead smelter to be erected by the Tintic Smelting Co., will be started within two weeks. The plant will have a capacity of about 250 tons per day. Two stacks will be used in the first unit. The site will be near the town of Silver City. The ore shipments from the Tintic district last week amounted to 148 carloads. The mines contributing and their respective amounts were: Ajax, 1; Beck Tunnel, 9; Bullion Beck, 8; Bullock, 1; Centennial Eureka, 53; Carisa, 4; Eureka Hill, 9; Eagle and Bluebell, 7; Grand Central, 6; Godiva, 2; Laclede, 1; May Day, 5; Mammoth, 6; Ridge and Valley, 3; Scranton, 6; Swansea, 6; Star Con., 4; Tintic Iron, 3; Uncle Sam Consolidated, 5 carloads.

The Beck Consolidated Mining Co., has begun excavations preparatory to the installation of a new hoisting plant. The Lower Mammoth Mining Co. has its two new hoisting plants in operation, and is shipping ore which lets a profit of about $11 per ton. The Mammoth Mining Co. has made a shipment of copper ore from the 2,260-ft. level; this will average 11%, with additional value in gold and silver.

Two judgments have been decreed against the Sheba Mining Co., with property in the Deep Creek mining district. One of them is for $23,444; the other for $9,475. The property has been ordered sold by the Court to satisfy these judgments.—— Conditions at the May Day mine are reported to be very encouraging. A raise on the 400 level has opened a 10-ft. breast of ore carrying 40% lead, and 20 oz. silver.——The Jennie Extension Gold Mining

Co. has been organized to develop a group of claims at Gold Springs, Iron county. The officers are: F. R. Davis, president; C. A. Short, vice-president and manager; H. R. Elliot, secretary and treasurer. The headquarters will be at Salt Lake City.—— It is expected that the new mill recently installed by the Jennie Gold Mining Co., at Gold Springs, will be in operation within a week. It will treat about 40 tons of ore per day.

The Governor, John C. Cutler, has disapproved the bill passed by the late legislature giving to smelting companies the privilege of condemning land within a radius of four miles of smelter sites. The executive holds that the bill was in the nature of class legislation, and therefore unconstitutional.

The management of the Consolidated Mercur Gold Mines Co. is making a normal production again, after having been handicapped for some time by a fuel famine and other difficulties.——The development of the Ingot mine at Mercur has been resumed. The property has been idle for several years. The Frisco Contact mine in Beaver county is being operated. The property was recently equipped with a steam hoisting plant.

The task of unwatering and reclaiming the Ontario and other mines at Park City is progressing slowly but surely. The three-mile drainage adit is now pretty well cleaned and repaired as far as Ontario No. 3 shaft. It is believed that the only remaining obstruction lies between shafts No. 2 and 3. The adit was closed on account of caves over two years ago.——The West Quincy Mining Co. of Park City has been prospecting its ground for several months with diamond-drills, and has encountered a contact vein, which is believed to be an extension of the old Quincy vein opened in the territory of the Daly-West Mining Co. The West Quincy Co. will sink a permanent working shaft.

The starting of the Utah Copper Co.'s concentrating mill at Garfield is likely to be delayed for several weeks for the reason that the Rio Grande Western railroad will not be in position to keep it supplied with ore.

Mexico.

Dividend From the Amparo.— Japanese Labor.— Hostotipaquillo District.— El Favor.— Mining in Oaxaca.— The Taviche District.—New Power Plant.—Smelter at Magdalena.—New Enterprises in Tepic.—Lluvio de Oro.

The annual report of the Amparo Mining Co., of Philadelphia, owning and operating the Santo Domingo and adjoining properties, about six miles south of Etzatlan, in the State of Jalisco, showed a profit for the year 1906 of $583,945, and a dividend of 3% (the first declared by this company), on its capital of $2,000,000, was paid on January 31 of this year. It is the expectation to make this 3% dividend quarterly. The great reserve from the 1906 earnings was retained for the purpose of paying for a number of needed improvements, chief among which are the three-compartment shaft, which is now being sunk; the 40-stamp 140-ton concentration and cyanide mill now in course of construction, and the 5,000-ft. aerial tram to lead from the mine to the mill, both of which it is expected to have in operation this coming June. This company is the pioneer in the introduction into this district of Japanese labor, and it is claimed that such Japs as have remained have given entire satisfaction, though about 40% of the entire number brought in have shipped out again, presumably for the United States.

The great success of the mines in the State of Sinaloa under purely Mexican management, after having been abandoned by their American owners, is somewhat of a blow to American pride. Natives lose no opportunity of pointing to San José de Gracia as an example of what Mexicans can do in mining. The former American owners took out many millions during their possession of the property. The insistence for large dividends and the lack of keeping prospecting ahead of mining brought the inevitable. A time came when prospecting had to be conducted without revenue from the mine. Tiring of this, and against the urgent advice of the manager, the property was sold to the former Mexican owners, who have reaped great profits from new discoveries. The mills are in steady operation and about 400 men are employed.

The Sierra Madre Mining & Devolpment Co. has started work on its properties near Madriles and at Sabinito. Both are in the district of Falite in the foothills. The property at Madriles created some excitement when discovered, owing to the exceedingly rich specimens of native silver found. The properties at Sabinito are *antiguas* with free-milling gold ore. The company is also examining other mining property with a view to purchase. A. W. Warwick is consulting engineer.

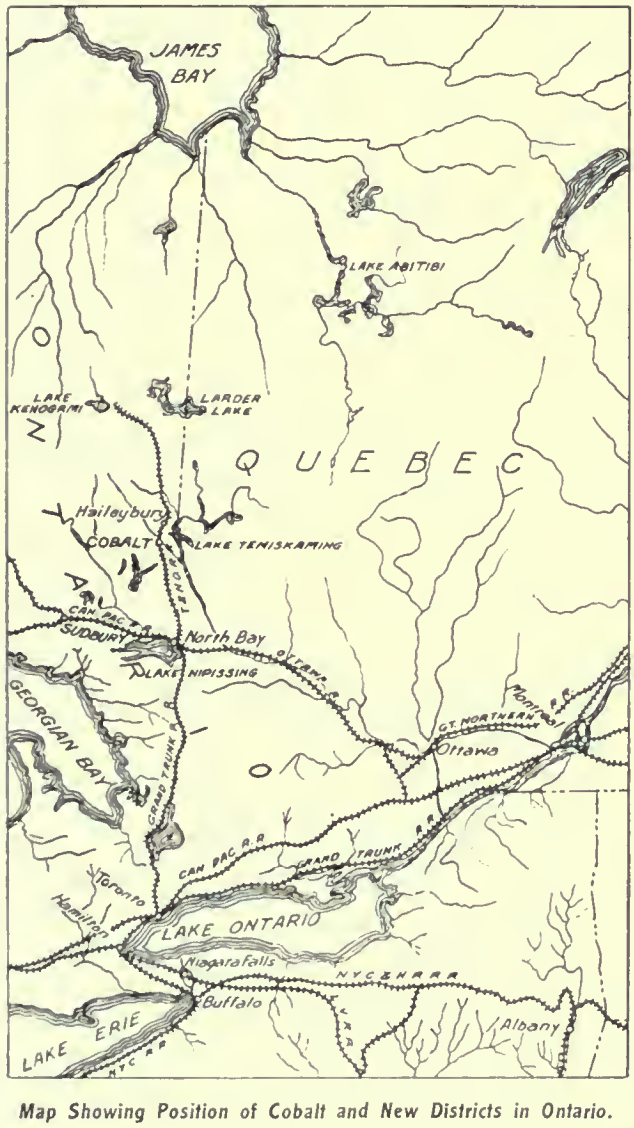
The Lluvia de Oro Co. will shortly have one of the most complete mining and milling plants in the State of Chihuahua. A mill is being erected of the most solid construction and from designs made in accordance with the experience gained during the last five years' milling practice. The great difficulty in Mexican mining is that of transportation. This has been entirely overcome by the management. Roads of really fine character have been laid out and built. These reflect the greatest credit on the engineering skill of the manager. The country is one of the most rugged on the west slope of the Sierras, yet the maximum grade of the roads is only seven per cent. Recently a large number of American artisans arrived at the mine to complete the construction of the mill. Several hundred mules are engaged in carrying the machinery. This mill will be in operation in about ten months. Robert Coleman, the consulting engineer, is at the mine personally directing the work.

North from Etzatlan, in the Hostotipaquillo district, Sanford McKeever, president of El Favor Mining Co., has leased for his company for a period of five years the old Hacienda de Pietro (an old *patio*) where a small testing plant for concentration and cyanidation will be installed, and as soon as the correct treatment has been determined the initial 100-ton mill will be erected on a suitable site. In the meantime the *arrastre* and *patio* will still be used on certain grades of ore. Most remarkable and unexpected bodies of ore have been opened up in the workings of El Favor in the last few months, proving beyond doubt that they are on the extension of the old Mololoa vein, and it is probable that the past bonanzas of the Mololoa (now being worked by Carlos Romero, of Etzatlan) will be equalled, if not surpassed, by El Favor when the latter begins mining, for as yet only the ore encountered in the development drifts and cross-cuts has been taken out.

The new mill of the Calabacillas company is in operation. Regular shipments of bullion are being made. On the lowest level a body of ore of high value has been encountered. Originally acquired as a low-grade mine, the Calabacillas bids fair to be a true bonanza. Several hundred men are employed. The mill of the ill-fated Oro Fino has been purchased by the Calabacillas, and is being moved to the latter mine. A. J. Underwood, who is largely interested financially in the mine, has personal charge of the property.

The name of the Mazeppa Consolidated Mining Co., adjoining the Cinco Minas of Martinez and Cardona, in Hostotipaquillo, has been changed the Aguila Amalgamated Mining Co., with J. B. Neily, of Boston, as president.

Among the new companies to start operations in the State of Oaxaca is the San Martin y Anexas Mining Co., organized with a capital of 400,000 *pesos*. Henry Lockhart, Jr., is president, and F. M. Leonard is general manager. The company is to take over and operate some 55 *pertinencias* in the San Martin district, 50 kilometres south of the town of Oaxaca, and only one mile from the new railroad. A good body of high-grade silver and gold ore has been opened up, and the company is prepared to expend $100,000 on machinery and improvements, among which will be a new hoist and pumps, and a 10-stamp mill.—— In the Providencia-San Carlos, of the Taviche district, a promising body of ore, assaying 8 kg. silver and 9 gm. gold per ton, has been encountered in a cross-cut from the 190-ft. level; and



Map Showing Position of Cobalt and New Districts in Ontario.

while this cross-cut was being driven a new boiler, hoist, compressor, and pump have been installed; the shaft will be sunk an additional 200 ft. The Rosario, in Taviche, is being unwatered and sinking has been resumed, and at the Nujeres property, also in Taviche, has started a new shaft and is continuing its adit toward the Escuadra, one of the richest properties in the district. G. W. Thompson has obtained control of La Tehuana Mining Co., and it is understood operations will be resumed at once.——A. P. Appelwhite has obtained a concession for a power-plant on the Rio Grande, near Cincatlan, for distribution in the Oaxaca and Taviche districts.—— Lloyd R. Hamer and associates seem to be meeting with unusual success at their little lead smelter at Magdalena, Oaxaca which has been running without interruption since its inception last summer, shipping its bullion to Europe. ——It is understood that the Taviche plant of the Oaxaca Smelting & Refining Co., on which the work of construction was stopped last fall, has made satisfactory arrangement with the mines, either by contract for the ores, or lease and bond on the properties, and has obtained the required additional capital, so that work will be resumed as soon as the machinery has been delivered.

Louis Fontz and Wm. Leonard have, through Wm. H. Lees, of Guadalajara, interested Chicago capital in the old San Jose de Ventanas property, in the Jora district of Tepic, about 10 hours' ride west of Hostotipaquillo, Jalisco. The new company will be known as the Cuatras Mining Co., of which Harry M. McIntosh, of Chicago, will have control, and Wm. H. Lees will be resident manager. The San Jose de Ventanas is one of the oldest properties in that part of the country, and was at one time owned by Tomas Treviño, one of the first owners also of the Mololoa, of Hostotipaquillo, now being worked by Carlos Romero, of Etzatlan. But the workings had been abandoned for years, and have just recently been unwatered by Fontz & Leonard, so that little can be said at present of the underground showings, though the old dumps, of which it is estimated there are something over 500,000 tons, give some indication of what has been produced, and a 30-ton experimental cyanide mill is to be erected for treating these old dumps, while the mine is put into shape for exploration and development work. The property is also situated on the government trail which is being built between Ixtlan del Rio and La Yesca, at which latter point the Buena Vista y Anexas Mining Co. has just completed the erection of a 180,000 *pesos* cyanide plant.—— Allan R. Partridge has obtained $200,000 from associates in Shreveport., La., for the operation of mines and smelter in the Huicicila district of Tepic.

Cobalt, Ontario.

Enlargement of the Productive Area.—Finds Beyond Cross Lake.—The Temiskaming Vein.—Rich Ore in the Rochester.—The Nipissing Mine.—Unprospected Territory.—Discovery in the Hudson Bay.—Several Finds in Bucke Township.—New Districts to the North.—Mining Under the Lakes.

For several months it was believed that the rich mines of the Cobalt district would be found to lie within a radius of 2½ miles. Today the extension of the productive area is a prominent feature. The shipping mines are steadily paying dividends. Their development work has proved the persistence of ore to 300 ft., and the returns show that only an infinitesimal portion of the low-grade ore leaves the camp. Thousands of tons of ore that will be treated at a profit are lying on the dump, awaiting the erection of concentrators and a local smelter.

The most important development is south of Cross lake. It is in this direction that the Drummond and Jacob mines and the Lawson vein are situated, but it was long believed that these were near the southern boundary of the productive area. It must be remembered that nowhere in the camp had there been found ore richer in silver than at the Foster and the Jacobs. One 20-ton carload from the Jacobs or Kerr Lake mine, shipped nearly a year ago, netted that company $76,000. The discovery of the Temiskaming vein at the 15-ft. level revealed that a wonderful orebody exists nearly two miles south of the Cross Lake properties. The Temiskaming is located in the Third Concession of Coleman, near Lorraine, and the company is now taking out ore that carries 18,000 oz. silver per ton. The orebody has been proved by driving on the vein for several feet, and a 20-ton car of this ore will be shipped shortly, the value of it being estimated at $150,000. There is no other camp in the world where silver mines ship carloads of ore like this.

At the Rochester, in the same concession and in the lot adjoining the Temiskaming, another marvelously rich orebody has been discovered, and further down on Lots No. 1 and 2, also in the Third Concession, Fred Calverley and Ed. Wettlaufer have made some good finds, which they have been trying to keep quiet.

The Nipissing is a mine that has caused a sensation. The property has been known to be large, but some have sought to create the impression that it was only the ground lying on Cobalt lake that would prove valuable. Of the 850 odd acres only a small portion has been prospected. Take the map of the township of Coleman and you will see that the Nipissing owns part of R.L. 400 or about 100 acres lying north of Cobalt lake and north of the T. & N. O. railway. The other part of R. L. 400 is owned by the Russell, Chambers & Ferland syndicate, which originally owned all of Nipissing. To the west of this 100 acres of the Nipissing and directly adjoining it are the Coniagas, Trethewey, and Hudson Bay properties, each containing 40 acres, the Coniagas being the southerly 40 acres and the Hudson Bay the northerly 40 acres, with the Trethewey in between them. The company designated as the Hudson Bay is really known as the Temiskaming & Hudson Bay Co., and like the Russell, Chambers & Ferland syndicate, got in on the ground floor and staked several acres. The celebrated Silver Queen was part of their original holding.

The splendid discovery made on these 40 acres, owned by the Hudson Bay Co. simply means another bonanza vein for the Nipissing. Last week the Hudson Bay people made known their discovery, which consists of a fissure four or five feet wide that has been uncovered for about 400 ft. It contains from 4 to 12 in. of solid ore, which in places is worn absolutely smooth by glacial action, and the entire width is highly mineralized. This vein runs slightly south of east and has been proved right up to the boundary of the Nipissing, and there is no reason in the world to doubt that it will be just as rich on the Nipissing property, and from there may run to the O'Brien, Chambers & Ferland property, which lies still further east. The important bearing that this discovery will have on the Trethewey is that the workings of this property are entirely at the southerly limit, and this discovery bears out what Frank Loring has claimed, namely, that the 35 or 38 odd acres of the Trethewey that are unprospected, and at present a great big blank, have enormous possibilities.

The owners of properties in Bucke township have been greatly excited over the rich discovery made on the east 20 acres of the northwest quarter of the north half of Lot 13 in the First Concession, formerly owned by McDonald & McMahon, now owned by the North Cobalt Mining Co., of which Dr. Von Hagen is the president. In the bottom of their shaft at the 35-ft. level a rich vein fully three inches wide has been found, a mass of calcite and silver. The wall-rock for a distance of three feet is so heavily shot with leaf silver that it will make high-grade ore. The shaft was started on a small calcite stringer, and is another proof of what the thoughtful men of the camp have been claiming for a long time, namely, that development of this district will prove the existence of an immense number of blind veins, and today no matter how rich the discovery may be, nothing is considered surprising. The new silver camp 50 miles up the Montreal river known as the Elk Lake Extension, the camp in the Temagami Reserve known as the Lady Evelyn, and the gold discoveries around Larder lake, and further north above the height of land at the Mosher Gold Camp, may be regarded as only the beginnings—a suggestion of the mining wealth in the millions of acres still unexplored in this portion of northern New Ontario.

At Cobalt itself the Lake propositions are attracting a great deal of attention, and none more so than the Peterson lake. This property is surrounded almost entirely by the Nipissing and consists of 228 acres of Peterson and Cart lakes, which are now being worked by the Peterson Lake Silver Mining Co. Fifteen veins have been proved to run into this lake from the Nipissing and Nova Scotia properties. The big bonanza vein heads for the lake. A large gang of men were employed last summer and over 170 acres will be worked this summer from the surface. Diamond-drill work is now going on and the drill is working on the lake near the Nipissing, and stripping is being done on the shore to locate this vein. Already fine indications of cobalt bloom and highly mineralized calcite have been found. The rich finds that were made on the Nova Scotia consisted of large slabs of native silver. The vein on which they were found runs right into the lake and these slabs were discovered less than 30 ft. from Peterson lake. No wonder a feeling of great optimism prevails throughout the camp.

Denver, Colorado.

Open Winter. — Scientific Associations. — Zinc Production. — Lake County and Its Varied Yield of Minerals.

Colorado has been rejoicing for the five months past in the most open winter the State has had for years. The temperature has been remarkably high and the quantity of snow that has fallen is unprecedentedly small. If no belated snowstorms come in the spring the prospector may betake himself to the hills much earlier than is usually possible. His prospect hole will be correspondingly dry, for the light snow-fall will operate to lower the amount of ground-water.

In the same way the districts whose water is mostly from the surface may look forward to a summer of light pumping, unless the dry winter is followed by a correspondingly wet summer. But what is one man's meat is another man's poison, and the state of affairs that makes the miner rejoice is bemoaned by the ranchman, who looks forward to a summer of restricted irrigation and small crops.

One of the most valuable privileges that an engineer can possess is the opportunity to mingle with his fellow-workers, and by the friction of mind against mind sharpen his own faculties to a greater keenness. The meetings of the American Institute of Mining Engineers are educational in the best sense. But meetings so infrequent and often at great distances from the mining centres can only partly serve the purpose. They need to be supplemented by local meetings, more frequent, enough so that all may find opportunity to attend a part, at least. This can best be met by the formation of local societies. A good example of such is the Colorado Scientific Society, at Denver, the earnestness and high quality of whose work is evidenced by the publications it has issued in the past. Another is the Pike's Peak Polytechnic Society, at Colorado Springs, which meets twice each month for the discussion of technical subjects, and maintains, in co-operation with Colorado College, a reading room and mining and metallurgical reference library. Smaller communities do well in imitating on a smaller scale as far as their circumstances will permit the work of such organizations, and thereby keep their members in touch with the progress of other workers in the same fields of endeavor.

In the great increase in the importance of zinc, certain Colorado districts find a notable addition to their mineral wealth. In ten years the value of the zinc produced annually in the United States has quadrupled and the quantity produced has more than doubled. This has

chiefly been due to the increase in the consumption of this metal, resulting from the progress of the electrical industry, so that a double production barely suffices for needs that were much more than met by the smaller production of a few years before. Under the stimulus of the increased demand, the metallurgy of zinc has developed, so that its recovery is cheaper and better than at any previous time, and the metal, whose presence in an ore was once deplored, is now welcomed. Colorado ranks high as a producer of zinc, about one-fifth of the total production of the United States being properly credited to this one State. Nearly all this comes from Leadville, Lake county furnishing over 80% of the total. Summit, Pitkin, and Mineral counties are its nearest competitors, each furnishing two or three per cent of the production.

Lake county stands supreme as the chief producer of mineral wealth among the counties of Colorado. In all except gold and coal it holds the first place. Teller county surpasses it in gold, with a production of $14,000,000, against Lake county's one million and San Miguel county's $2,500,000. In most of the other useful metals, it is more than double its nearest competitor, with three millions in silver as against $1,500,000 for Pitkin county, $2,500,000 of lead against less than a million for Pitkin county, $750,000 of copper as compared with less than $500,000 for San Juan county; and more than twenty times as much zinc as Summit county. It well deserves the title of the chief province of a mineral empire.

Johannesburg, Transvaal.

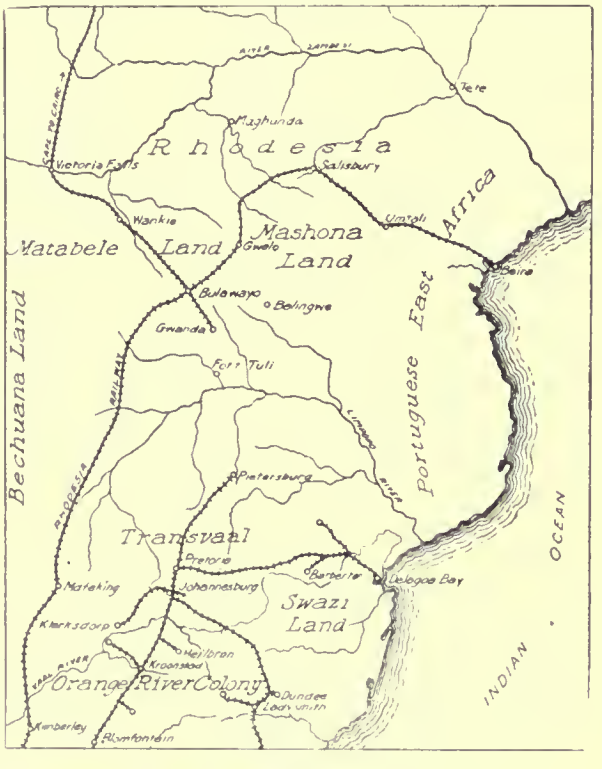
After the Election.—Results Fairly Satisfactory.—British Acceptance of a Boer Administration.—The Problem of the Unemployed.—Chinese New Year.—The Gordon Drill.

The battle is over; the dead and wounded have been buried or amputated, and the field is clear once more. In other words, the election is over. And jolly glad every one is! The campaign was a hard-fought one, and now both victor and vanquished are resting after the fight. Very few available voters were allowed to remain at home. The lethargic ones were pulled out of the mine, or out of bed, and taken to the polls by the enthusiasts of the different parties.

On the whole, the results are fairly satisfactory. The Progressive champion, Sir Percy Fitzpatrick, gained a complete victory over the Nationalist and Het Volk champion in Pretoria, namely Sir Richard Solomon. From the first it was apparent that the Progressives would be utterly routed, but this has proved false, as the Progressives have, on the whole, made a good showing. The Dutch party, Het Volk, will have a majority in the Lower House of 19 or 20, but the Progressive minority is made up of men of such fighting calibre that they will make their influence felt. It is too early yet to say who will be the first Premier under British rule, but now that Sir Richard Solomon is defeated, it is highly probable that General Smuts will be called to this high office. He is an able advocate in Pretoria, whose knowledge of the mining industry is meagre. Only a few years ago he was one of the most successful generals in the field against the British forces. Today or very shortly he will probably be Premier! [General Louis Botha has become Premier, but our correspondent's remarks would apply to him also.—Editor.]

The mines got through election day very well. Almost all the men turned out to work, and were given every opportunity to vote. The artisans went almost solid for the Progressives, only a few Labor members being returned. It will be some time yet before the members of Parliament get to work, and we know their feeling toward the mining industry. Thousands of Chinese contracts will terminate this year, and, if the coolies are sent away, there will be a serious shortage of labor. The general feeling is that there will be something of a compromise on the Chinese question, and that the industry will be allowed to retain about 60,000 coolies. Since the anti-Chinese champion, Mr. Creswell, was defeated by a Progressive, people do not expect any drastic measures.

The problem of the unemployed is still with us. On account of the prosperity now reigning in Australia, an effort is being made to get the stranded Australians now on the Rand back to their country. The unfortunate part of the business is that in six months or so, provided there is favorable legislation, all those now out-of-work will be needed on the Rand. The Government has started relief work, in the form of road building in the Rustenberg district, but it is noticed that there is no rush on the part of the unemployed. As a matter of fact, the question of unemployed is more difficult on the



Map of the African Goldfields.

Rand than in almost any other part of the world, for the white laborer gets very proud out here, and frequently refuses a job if he thinks it is below his dignity.——The Chinese new year festivities went off successfully, and there were no outbreaks or crimes. The coolies took the three days allowed them by law, and during that time most of the mills of the Chinese mines were idle. February will therefore show a decrease in the gold output.

The Lion Hill diamond mine is still a great favorite with the public, the shares having touched £20 several times. One of the big houses has taken up the proposition, so that there will be plenty of capital to prove whether the prospect will turn into a mine.——The annual meeting of the Randfontein Estates was held recently. This is a large group of mines, controlled by J. B. Robinson, on the West Rand. The two most important points raised at the meeting were the scheme for a big electric central power-station. It will be a bit of a blow to the promoters of the Victoria Falls power scheme to know that they will probably lose the custom of Randfontein. The other important point is the high praise given the Gordon stope-drill, which has been designed to replace hammer-men in narrow stopes. If this drill proves the success that some claim for it, the demand for unskilled labor will be greatly reduced.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE cost of refining a ton of crude copper by electrolysis varies greatly, ranging from about $10 up to nearly $25, but the average cost is likely to be about $11.50 to $13.50.

A RESIDUAL CLAY derived from a rock composed entirely of feldspar, or one containing little or no iron oxide, is usually white and therefore termed a 'kaolin.' Deposits of this type may contain a high percentage of the mineral kaolinite.

A STUDY of economic geology shows that the deposits of both lead and zinc ore, whether in association or alone, form most readily in connection with a dolomite or limestone country. Most of the great lead and zinc ore deposits of the world occur in formations of those rocks.

THE La Salle St. tunnel under the Chicago river is having its crown removed, and as the originally proposed new roof has not been built, this tunnel is now practically destroyed and abandoned. A steam drilling scow, such as is used in harbor improvement work, was employed to drill holes in the roof for blasting, and the site was dredged by a large dipper dredge.

THE stamps of Gilpin county, Colorado, drop about 30 times per minute, while the average on the Mother Lode of California is about 90, with a maximum of about 105. In Colorado the stamp weighs from 500 to 600 lb., while in California 850 lb. is the average, with 1,100 lb. as a maximum. In Colorado, the drop ranges from 16 to 20 in., in California, from four to six inches.

THE life of a mortar-screen depends upon the hardness of the ore, the acidity of the battery water, the attention given to them, etc., but it is chiefly regulated by the length of time which the superintendent considers it desirable to retain them in service. A screen will often last without breaking for 20 days or more, but its openings become so enlarged by abrasion that a much coarser product escapes from the mortar.

UNDER processes recently patented an improvement in the manufacture of stone-like substances has been achieved. The inventor has succeeded in what is little short of a reconstruction of many well-known qualities of building stone. By a slight modification, all kinds of marble are produced, and one of the chief successes has been in the manfacture of lithographic stone, which has been pronounced by experts to surpass the natural material.

OVER 500,000,000 gal. of water are pumped out of the anthracite coal mines of Pennsylvania every day in the year. The exact average for 1905 was 633,000,000 gal. per day. Nearly 1,000 powerful engines, delivering from mine bottom to surface 500,000 gal. of water per minute, are required. Mines may be shut down and coal production suspended, but the water flows on forever. The cost of removing it is one of the important items of expense that make up the price of anthracite.

IN THE mortar of the stamp-mill, the irregular splash of the water causes an unequal sizing of the pulp, as the particles of pulverized material may pass through the screen or be retained in the mortar, depending upon whether any particle is thrown against an opening or a blank in the screen. If a particle does not pass through, it is drawn back by water and undergoes further reduction in size. This action takes place to a greater extent in a deep mortar with a punched screen, than in a shallow mortar with a wire screen.

THE Land Department has held that the pendency of an adverse suit excuses for the time being the performance of annual labor. The Courts have not as yet passed upon the question. The ruling of the Land Department may be upheld as between the litigation parties, but there might be danger from re-location by outside parties disconnected with the litigation. It would be prudent to perform the work, or at least make a *bona fide* attempt to perform it. If the attempt is frustrated by acts, or threatened acts, of violence, performance would be excused. [This appeared in our issue of January 7, and is repeated now in consequence of further queries covering the same ground.—Editor.]

EXPOSURE to high pressures of oxygen produces convulsions in most animals when in the compressed-air chamber, and these may continue after rapid decompression. Convulsions are not so likely to be produced in animals after rapid decompression from compressed atmospheric air, but the respiration may become embarrassed, and there may be paralysis or death. With compressed atmospheric air it was found that convulsions did not occur until 12 atmospheres were reached, owing to intoxication from the oxygen being too gradual. The convulsions end in paralysis, but after rapid decompression from oxygen the convulsions still continue because the oxygen set free can maintain the life of the tissues. In decompression of atmospheric air it is nitrogen that is set free.

PROFESSOR MOISSAN, in vaporizing gold in the electric furnace, finds that 100 to 150 gr. can be evaporated in two or three minutes. By condensing the gold vapor on a cool surface, either filiform masses or cubical crystals can be obtained. It is found that gold, like copper and iron, dissolves a certain amount of carbon when in the liquid state, but this separates out as graphite on cooling. Gold is to be found less volatile than copper. The properties of distilled gold are the same as those of hammered gold, or the melted metal reduced to a fine powder. When an alloy of copper and gold is distilled, the vapor of copper comes over first, showing that there is no definite compound. In the case of alloys of gold and tin, the latter metal burns in contact with air. This tin oxide is found to be of a purple color, due to a deposit of fine gold on its surface.

THE strongest brick ever tested at the Watertown Arsenal was a paving brick from St. Louis, Mo., which showed a compressive strength of 38,446 lb. per sq. in., with a modulus of elasticity of 8,510,000. The absorption was 0.21% by weight and 0.5% by volume. The sample tested was set on end and measured 2.45 by 3.09 in. in cross-section. Granite of 51,990 lb. per. sq. in. compressive strength came from a quarry in Asheville, N. C. Ordinary granites range from 20,000 to 30,000 lb. per sq. in. Cement-rock is the stone from which natural cement is made in the State of New York. A brick of 38,446-lb. strength was tested. Ordinary values for hard-burned brick range from 12,000 to 25,000 lb. per sq. in. Portland cement, set under pressure, attained the maximum strength yet observed in this material. This sample was exposed to an initial pressure of 14,000 lb. per sq. in. while setting. The strength given was displayed by the cement at the age of 57 days. The compressed strength of ordinary portland cement, tested neat, ranges from 6,000 to 9,260 lb. per square inch.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Pans vs. Tube-Mills.

The Editor:

Sir — With reference to the discussions that have appeared in the MINING AND SCIENTIFIC PRESS regarding the relative merits of pans and tube-mills as sliming machines, it may be of interest to publish the results of some tests carried out at the Dolores mill, in Chihuahua, Mexico.

In test No. 1, the ore was crushed with cyanide solution by 15 stamps, weighing 900 lb., through a 2-mesh screen, the pulp passing to the two Bryan mills with 60-mesh screens, then to four pans in series, thence through two settlers, and finally through two cone-classifiers. The overflow from the classifiers went to the agitation plant, and the underflow was returned to the tube-mill for re-grinding, the re-ground product joining the stream from the settlers at the head of the cones.

In test No. 2, the pulp from the Bryans passed directly to the tube-mill, thence to the cones, the overflow as before to the agitation plant, the underflow being returned to the head of the pan series, thence through settlers to cones as before.

In both tests samples were taken every hour, over periods of twelve hours, from the heads of the tube-mill and heads of pans, and also from the discharge of same. The bulk 12-hour sample was determined from the proportion of sand and slime in each sample, the difference in slime content between heading and tailing being taken as the sliming power of each machine.

The following are the results obtained, from the average of five samples:

TEST NO. 1.

	Percentage of slime.		Percentage of slime.
Tube-mill heading	8.20	Pan heading	11.02
" " tailing	42.64	" tailing	52.54
Slimed by tube-mill	34.44	By pans	41.52

TEST NO. 2.

	Percentage of slime.		Percentage of slime.
Tube-mill heading	4.66	Pan heading	7.36
" " tailing	44.08	" tailing	51.88
Slimed by tube-mill	39.42	By pans	44.52

Taking an average of both tests, to bring the machines under the same conditions, gives the following result:

Percentage slimed by tube-mill	36.93
" " " pans	43.02
" In favor of pans	6 09

The pans used are of the Wheeler type, with plain flat muller and dies; they have a diameter of five feet. The speed is 65 rev. per min. The power required to drive the four pans is 50 h.p. The tube-mill is a machine specially constructed by Allis-Chalmers, made in sections for mule transport, and I believe is one of the first, if not the first sectional tube-mill made. It has a length inside of 16½ ft. by 3 ft. 6 in. diam., and runs at a speed of 35 revolutions. It is lined with white iron, and carries a load of 4½ tons of flint pebbles. The power required to drive it is 20 horse-power.

Although the above tests showed a small margin in favor of the pans for sliming, yet when the question of power and cost are considered the tube-mill is undoubtedly the more economical machine. The wear and tear in the case of the pans is considerably more than that of the tube-mill, and the difference in power required for driving, by itself would more than minimize any advantage the pans have in sliming capacity.

ROBERT CLARKE.

Dolores, February 17.

Those Bob-Tailed Words.

The Editor:

Sir — I wish to enter a word of protest against what seems to be a prevailing use by a few of the leading mining journals of singular nouns for plural — shaving, tailing, *et cetera*.

The leavings after quartz is crushed and the free gold removed are tailings. One could not correctly say dregs are tailing, dregs are tailings. The man who doesn't believe there is plurality to the product of a stamp-mill should be given the task of counting the particles in a few tons. According to the new fashion I would have to write this "particle in a few ton," but it so happens there are particles and tons.

I well remember that when I stood before my own zinc lathe it wasn't a shaving I made, but shavings, and lots of them. I recognize that now, when most of this work is done by machinery, a shaving may be a mile or more in length. We may break this shaving and put part of it in one compartment of a zinc-box and part in another. Thus, it seems to me, we have shavings, and it would be hard to find an extractor that didn't have more than one shaving in each compartment.

Please stock up on the s box, and don't let the printer get out of 'sorts' again. It jars an intelligent reader to have such obvious misuse of words.

MATT. W. ALDERSON.

Helena, Montana, March 18.

[We disagree with Mr. Alderson, as our readers will be aware. But we take pleasure in publishing the expression of views contrary to our own. Open discussion is valuable.—Editor.]

Black Sands.

The Editor:

Sir—Your timely editorial on 'Black Sands Again' is to the point and greatly appreciated. Field experience of the writer corroborates the statements made. Dr. Day's investigations have been of little practical benefit, and have caused useless expenditure of time, energy, and money by investors that were led to believe that a new source of mineral wealth had been discovered by the learned member of the Geological Survey. The promoters made much capital of the experiments at the Portland Exposition, as it was only necessary to send samples of their own taking, and receive in effect an endorsement as to the value of their property. This class of people had never before appreciated so thoroughly the work of the Survey.

The difficulty with the whole matter, from an engineering standpoint, is that there is no known body of black sand of sufficient size and value to warrant consideration.

Experience on one examination may be taken as typical. The promoter, after discoursing at great length in glittering generalities on the merits of the property, when requested to designate some place where values could be found, led the way to a favored spot, where scratching at the roots of a tree he produced some handfuls of debris, which, when panned, showed a few minute scales of platinum. I say "favored spot," because two other engineers, as I afterward ascertained, were taken to the same place. No values were found elsewhere on the property, except at a few spots, the result of local concentration.

Investors to whom 'black sands' still appeal would do

well to demand a guarantee sufficient to cover expenses before causing an examination to be made.

CHARLES JANIN.

Oakland, California, March 30.

The Butters Filter.

The Editor:

Sir—So much has recently been written about the respective merits of the Butters and other filters and so few actual data have been given that I thought it would interest the mining public to get the working costs, as well as the metallurgical results achieved by the Butters filter during the period of continuous running.

The article by Mr. F. L. Bosqui, in your issue of February 2, covers the ground so well from my point of view that I shall simply endorse it as written and make no further comment. I would point out that my figures relate to one year's continuous running and that the filter in question has been steadily working for more than eighteen months. Nevertheless, it is in as good condition today as when it was first erected.

The high cost of freighting between the Coast and Copala tends to increase the cost of maintenance. The following is the summary:

FOR YEAR ENDING JANUARY 31, 1907.

Total tonnage filtered	24,066 tons
Average filter-residues during year	Gold 9 cents, silver 0.98 oz.
Average charge per filter of 94 leaves	20.02 tons
Number of charges	1,202
Average time of operating one charge	1 hr. 36 min.

COST OF MAINTENANCE.

Acid (HCl) for washing filter-leaves one year	$1,596.00
Repairs to filter	2.69
Repairs to 4-in. centrifugal pumps	49.60
Repairs to vacuum-pump	3.50
Total	$1,651.79

COST OF POWER.

Vacuum-pump (4 h.p.) 1,622 hr., at 17 cents per hr	$ 110.29
Centrifugal pump for elevating excess pulp and solutions, 8 h.p., 801 hr.	108.93
Centrifugal pump for elevating the filtrate, 8 h.p., 365 hr.	49.64
Excess slime agitator, 2.5 h.p., 550 hr.	23.37
Total	$ 292.23

COST OF LABOR.

One man at $45 per month, one year	$ 540.00
One boy at $12 " " " "	144.00
Extra help, washing frames, etc.	32.00
Total	$ 716.00

Yearly cost of maintenance	$1,651.79
" " " power	292.23
" " " labor	716.00
Total yearly cost	$2,660.02
Cost per ton of slime	$0.1105

The capacity of the filter is 200 tons per day, but it has never been taxed to even 50% of its capabity; in fact, the unit-charge is now 26.5 tons and the results are quite as good as with the smaller tonnage.

In conclusion, I would say that we have gone on record with a complete sheet of operations and it would be interesting to see similar data published from the other filters on the market. Mr. Bosqui's suggestion is a practical one.

JAMES FRIER,

Manager for the Butters Copala Mines Co.

Copala, Mexico, March 5.

The Meaning of Striations.

The Editor:

Sir—I have seen somewhere that if a vein is enriched as the result of a fault, the enrichment would take place along the upper side of the fault. Is there any such law, and if so, which is the 'upper side' of the fault?

I also understand that the striations on the walls of a vein, due to movement, bear some relation to the position of the ore in the vein. Is there anything in this theory? A vein that I have been endeavoring to open up is cut by a dike. The striations 500 ft. from the dike are almost horizontal, but dipping slightly toward the dike, while the striations about 30 ft. from the dike dip at an angle of about 30° from the vertical, also in the direction of the dike. The best ore that I have found in the vein occurs at this point, but the vein does not average well. Do these striations argue for better bodies of ore below, or are they simply the evidence of movements having taken place in the vein independent of any economic value?

At the opening about 30 ft. from the dike, although the vein might be said to be quartz, a stringer of crystalline calcite about four inches thick occurs near the centre of the vein, giving it a banded appearance. This calcite carries no mineral, but the adjacent quartz does. The country traversed by the vein is diorite, and there is no lime within a mile of it. Is this a favorable indication? The ore is a gold-bearing chalcopyrite.

HORACE W. BUCKE.

Ketchikan, February 28.

[In regard to the effect of a fault, the enrichment will depend upon the direction of flow of the mineral solutions that followed the line of the fault; if from below, the upper part of the faulted vein will be benefited; if from above, then that part of the vein below the intersection. A fault that enriches another vein is really a beneficiating cross-vein. At Rico, Colorado, these relations are well emphasized. Speaking generally, down to the ground-water level, the solutions producing enrichment are likely to have been from above; if such an effect is observed below the level of ground-water, it is likely to be due to ascending solutions.

Yes, striations are regarded as indicating the direction of movement in fault-veins, and there is reason to believe that such movement has influenced the pitch of ore-shoots, by creating a well-defined width of crushed rock or band of shattered material easily penetrated by enriching mineral solutions.

In regard to the calcite, it is a fact that in the celebrated Cobalt district, the rich ore accompanies calcite, the presence of which marks the line of passage of the ore-forming waters that made the bonanzas of silver mineral. At the Palmilla mine, in Chihuahua, Mexico, there is a big vein of calcite near the place where large orebodies are found. It is likely that this calcite, while itself uot valuable, marks the occurrence of a period of secondary ore concentration. We shall be glad to see the matter discussed by some of our geologists.—Editor.]

MICA is only of value when found in considerable quantities and in the form of large sheets. Small quantities of this mineral have come from South Dakota and Wyoming, but most of our domestic mica comes from New Hampshire. The finest and cheapest mica we have is imported from India, while Canada produces a good deal of non-transparent mica. The whole United States only produces about $100,000 worth of mica per year, of which New Hampshire produces about $70,000 and North Carolina $25,000, leaving only about $5,000 for other States.

STALACTITES are formed by waters containing limestone in solution percolating through the roofs of limestone caverns. Some stalactites are of enormous weight and several yards in length, having taken form from the gradual drip of water from above, and to obtain a growth six feet long and a weight of 500 lb. has taken hundreds of years, the infinitesimal quantity of lime in each drop of water producing a splendid structure in the course of ages.

Old Mexican Workings and Some Remarks on Sampling.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

At the Peregrina mine, near Guanajuato, I had a good opportunity of examining some typical old Spanish-Mexican workings. We entered by a door into a small gallery and thence through the opening or mouth of the mine (*boca de mina*) that descended into the darkness. The way was down a twisting stairway that zig-zagged within the vein-walls; the steps were laid in lime mortar, the general slope varying between 45 and 56°. Such passages are common in the old Mexican mines; they are made in stopes, the filling of which has been used to build the masonry of the stairway. At intervals shrines are to be seen; there was one 30 ft. from the entrance, just at the end of daylight, and there was a principal shrine in a parapet above the big workings (*obra grande*) at the 100-ft. level. Every shrine is guarded by lighted candles, left there by the miners; and it is said that they will even go up and down the underground passages in the dark in order to save candles for this purpose. At about 5 o'clock, when the shifts change, there are 150 to 200 candles burning before the principal shrine, forming a grand illumination, the effect of which is heightened by the cavernous old stopes that yawn in front of the sacred image. As they pass it, the men stop and make a genuflection, with the sign of the cross. Descending further, the stairway becomes wider as it passes into the big stope and we noticed another shrine—a cross set in a frame, with a solitary candle; this marks the spot where a man carrying drills (*refaccionero*) tripped at the head of a series of steps and fell fatally.

Flash-Light Photograph of a Big Stope in the Peregrina Mine.

The big stope is a cavernous excavation 250 ft. long, by 450 ft. deep, and 8 to 25 ft. wide. The footway at the end of the first stairs, about 100 ft. from daylight, is blasted in the wall of the lode and is provided with a parapet of masonry. Leaning over it, one looks into an abyss, the effect being like a miniature Cornice road underground. The lode is nearly vertical, changing from 80° W at the south end of the mine, to a dip of 70° E at the north end. The ore is from 8 to 20 ft. wide; it consists of quartz, partially ribboned and traversing a breccia, the edges of which show replacement; it follows a line of fracture in the breccia; where the vein is tight and the quartz massive, the silver is highest in proportion to gold, ranging from 50 to 55%. Going south the lode becomes more open, the vugs contain clay, and there is such evidence of leaching as is usually seen close to the surface. In this part of the mine the proportion of silver to gold is smaller. The Mexicans could not work the gold ore because the *haciendas* paid nothing for gold and the ore-buyers gave only 30 *centavos* per gram, when it is really worth 66 cents or about 140 *centavos* per gram. This ore cannot be sorted like that which is rich in silver, the argentite being visible in threads and spots, while the metallic gold is disseminated in particles too small to be seen. The argentite sometimes impregnates the calcedonic quartz so delicately as to make a moss agate.

Our progress through the mine was lighted by two *peones* who carried *mechas* or torches. Mr. E. P. Ryan, the superintendent of the property, carried an acetylene lamp, so that the old and the new were well contrasted. The time may come when acetylene will be in general use underground, but it will not become popular until the present lamp is superseded by something better. As it is now, you have a small can that holds the granulated calcium carbide and to this water is added; then the cover is securely replaced and the chemical action produces the acetylene gas, which is lit as it escapes through a small aperture. The smell of it gave me a headache, both in Mexico and in the Lake Superior copper mines, the two districts where I used acetylene lamps. But there is a newer invention that promises to prevent the escape of gas and the consequent headache. The emission of gas is nicely regulated and all of it is burnt in the process of illumination.

We met boys (*tanateros*) carrying waste in *tanates*, the bags made of the fibre taken from the *ixtli*, a variety of *maguey*. We were passed by others who were descending to the place of their work, whistling as they went at a trot down the rough steps. Then, in contrast to such breathing antiquities, we found a couple of young min-

ing engineers* who were taking samples in a thoroughly modern way, aided by Mexican miners to do the moiling. The quartz ore was hard and 10 to 15 ft. wide, so that two moils were blunted per foot of sampling. They used the straw hats of the *barreteros* to catch the sample. As we proceeded, I could see by the white channeling across the dark drifts that the sampling was being well done.

Speaking of sampling, reminds me of the old dumps and the way they were tested. At the Peregrina, this work was done by George A. Schroter. He did it with system and care. An aggregate of 250 ft. of shaft-sinking was required; one shaft was as much as 70 ft. deep, the usual depth being 40 ft. Each shaft was 3 by 4 ft. in the clear; it was kept open by small timbers of 4 by 6 in. cross-section. Two-inch round oak spiling was driven over a 'bridge' by double-hand hammers, as fast as the ground yielded, in consequence of the removal of the material at the bottom. The hoisting was done in baskets. The average cost was $1.25 for the first metre and then 25 cents extra for each succeeding metre of sinking. The material obtained from each metre of shaft was kept separate and sorted, for 25 *centavos* per ton. This sorting was done by women, who made three piles, consisting respectively of fine ore, lump quartz, and waste. On the day of my visit there were 60 to 70 women at work, handling 100 to 110 tons per day. They are better than men—more steady, because they do not stop to smoke a cigarette; nor do they steal as much as their husbands and brothers. The sorting is done with a 3-lb. hammer, a horn spoon, and wicker basket (*chiquihuite*) reinforced with hide, holding about 30 lb. of ore. The dump contained $8 to $9 per ton, 70% of this assay-value being in gold. In the open-cut, where the ore is mixed with wall-rock, the assays averaged about $4.50 per ton. Underground, it was found that the filling of old stopes ranged between $5 and $10, being highest in the southern part of the mine, where the ore is more difficult to sort.

The dumps of Guanajuato have figured largely in recent prospectuses, many companies having been organized with the particular purpose of treating the ore left by the old Mexican managements. On careful inquiry, I can give the average assay-value of the best of these immense accumulations as 4 to 6 oz. silver, and 1.5 gr. gold per ton, equivalent to, say, $4 per ton.

When the American invasion began, the Mexican was not slow to appreciate his opportunity. In one case, *peones* were set to work removing the dump in sacks and loading *burros* with it, so as to impress a visitor with the idea that the stuff was fairly rich. But grab samples gave 5 oz. silver per ton. It was hardly worth sacking!

As regards sampling, in our conversations emphasis was laid upon the danger of doing the work without trustworthy assistance. When using outside help, it is difficult to prevent salting, if well planned, unless the following three operations be performed:

1. Take samples with the help of the miners available.
2. Blast the lode at a few points and take check samples.
3. Cut down another set of samples yourself, with the aid of the one personal assistant, without which such work should not be undertaken.

Mexican miners make poor assistants to an engineer sampling a mine. When the groove is being cut across the vein, they linger in the rich ore from force of habit; it is hard to make them understand that the poor quartz must be included. To this very day, the Mexicans at Guanajuato deride American engineers' method of sampling. One of our friends had taken a large sample laboriously and carefully; he was just in time to see the foreman of the mine in the act of throwing out pieces of poor rock. "*Tiene nada*," it carries nothing, he explained, as though it were foolish to include anything but rich ore. Other engineers can tell you of similar experiences, when after breaking a sample with infinite care to make it a true section of the vein, their Mexican helper has picked out the barren-looking quartz. The whole training of the native for generations has been to sort his ore, rejecting the poor stuff, and he cannot get it into his head that anyone should do otherwise. But he is not the only eccentric; I remember that more than once in Western Australia owners of mining claims, or their representatives, wondered why I did not sample the small patches of specimen ore. One incident I shall not forget, for I have a memento of it. Having been retained to inspect a mine at Red Hill, near Coolgardie, I was escorted to the spot—50 miles away—by a Mr. Patrick Walsh, a local celebrity of the boom days. His language was picturesque and free, he had rudimentary ideas of mining, and he took me for a tenderfoot—they call them 'new chums' in Australia. The mine had several shafts and a couple of shallow adits, most of which had but little ore to show, but on the top of a small ridge there was a trench that exposed a quartz cropping in which glistened a patch of beautiful specimen of gold ore—ounces to the pound. I admired it and proceeded to pass on, but he asked me if I did not intend to take a sample, for in those days pseudo-experts took a dozen samples of poor quartz, and then a thirteenth unlucky one of specimen stuff, and averaged the lot, with the result that 4 dwt. ore appeared in their report as running 2 oz. 10 dwt., or something like it. Seeing that Mr. Walsh would think I was not fair to his mine if I demurred, the sample was taken. But it was never assayed; the gold was melted, and I now possess a pair of handsome cuff buttons to remind me of Red Hill, Western Australia.

To return to Guanajuato; sampling of the streaky lodes in that district is difficult; re-sampling of the same groove is known to have given three such divergent results as 1,800, 350, and 150 grams of silver per ton. The discrepancy is due in part to the fact that the threads of argentite are thin and wavy in direction, so that when the groove is made deeper by a later cut, the amount of silver mineral obtained is less or more, according to the chances of striking or missing a streak or *hilo* of argentite. Re-sampling is usually accompanied, in the case of an intelligent engineer, by the special desire to avoid taking too much of the rich stuff, and this is apt to cause a leaning the contrary way. On the other hand, the first sampling—made for the vendor—is apt to be left to the Mexicans, who instinctively put too much of the soft argentite into the hat that holds the ore as it is broken.

The story is told of a mine that, along its main level, showed a width of 8 to 10 ft. of beautiful quartz ribboned with black threads of rich mineral. The back of the drift looked handsome. An option was secured by Americans residing at Guanajuato, who knew rich ore when they saw it. The sampling done by an engineer in behalf of a putative purchaser gave the astonishingly low results of an average of $2 per ton. A protest against this finding ended in the breaking of a few tons of ore with a view to checking the sampling, and the result was 5 cents per ton less. The black streaks were stibnite!

There was another story of an ore-purchasing agent who found that the smelter returns at Monterey were 30% less than his own sampling, on which he had made settlements with the Mexicans. He discovered that the ore, when being sampled at the mine, was turned over in

*G. A. Kennedy, of the Colorado School of Mines, and L. C. Pearce, of the Michigan College of Mines.

the teeth of a wind that blew the fine black (silver) dust over the fraction representing the pulp that went to the assayer. This residual portion was always placed to leeward. He lost 8,000 *pesos*, but took his medicine like a sportsman. In the course of time, it was decided to sample at the receiving station instead of at the mine; there was a nice yard (*patio*) available for the purpose, it was paved with red brick of the usual soft character. The *buscones* (tributers, or lessees of the mine) sent a representative to watch the sampling in their interest, and he noticed that the sweeping of the floor threw red brick-dust into the sample. He became fussy, and insisted that the objectionable material should be ejected, and it was. The ore-buyers' agent did not prove obdurate, for the brick-dust included fine particles of rich ore that filtered to the bottom, making a mixture 15% richer than the average. The 8,000 *pesos* that had been lost were soon recovered, and a few more to make them comfortable.

The buying used to be done entirely at sight, the grade and weight were both guessed — with plentiful allowance for error and deception. The *buscon* would make a pile and put big chunks of good ore on the outside, and then fill his mouth with water and squirt it over the pile, so as to make a fine showing of black (silver) streaks across the gray rock, on the same principle as the old woman who polished the apples for sale on her stall.

To change the subject, let me tell the story of a strike. Order is not difficult to maintain at a mining town like Guanajuato, because the people possess a lively respect for the representatives of the law. The strike at the Peregrina mine affords an example. In that episode there figured 500 *peones;* there came four undersized soldiers and a most unimpressive *jefe politico*, or sheriff. The *patio* was full of the striking miners, ready for a riot. The little *jefe* told the manager to open the *patio;* the big doors swung aside; the four soldiers entered with their muskets clubbed and the *jefe* behind them with a drawn sword. The laborers scattered like rabbits, the four soldiers whacked all within their reach, the *peones* fled and fell over the dump; the strike was over!

The introduction of electric power has been of great help in the re-opening of the old mines at Guanajuato. It used to cost 400 *pesos* per horse-power per annum, burning oak fuel and using compound engines. Now the rate is five *pesos* per horse-power month for the right to use electricity, and 0.026 *centavos* per kilowatt-hour, the latter being equal to about five *pesos* more per month if running steadily, making the cost 10 *pesos* per h.p. month. The power comes from the falls of Zamora, on the Duero river, in the State of Michoacan and 101 miles from Guanajuato. There 45,000 to 60,000 volts is generated, with a step-down to 15,000 volts and again to 440 volts. Four thousand horse-power is generated and another plant of equal capacity is in hand. (This must now be completed, for I speak of more than a year ago, when I visited Guanajuato.) The natives were troublesome at first; they cut and stole several hundred metres of copper wire. Two men were killed by a live wire, after public warning of the danger. There was also some difficulty at first in transmitting power, by reason of the sudden change in temperature at dawn, where there is a rise of 15° C. This causes condensation of moisture on the porcelain insulators, which remain cool after the temperature of the surrounding air has risen. The moisture on the insulators is sufficient to cause the current to short-circuit between the iron pin of the insulator and the cross-arm of the iron tower. This happens between 5 and 6 A. M. The only way to stop it is to turn off the current, so that there is a break for an hour. However, energetic investigation into the subject will solve this difficulty, a return to wooden pins being possible. At first the break in transmission was attributed to the malice of discharged employees and then to the eagles, many of which were found dead at the base of the towers. They alight on the top of the iron towers at dawn and stretch their wings so as to arc across the wires, being killed instantly but establishing a short-circuit through themselves before they drop.

Sorting Ore at the Peregrina Mine.

THE touchstone of the jeweler is a jasper of a velvety black color.

The Geology of Goldfield, Nevada.

By FREDERICK LESLIE RANSOME.

*Goldfield is situated on the southern rim of one of the typical desert basins of the region, which merges through a low pass 22 miles north of town into the still larger basin west of Tonopah. A large part of the district may be described as a rolling plateau ranging from 5,700 to 5,800 ft. in general elevation and surmounted by many irregularly distributed peaks and knobs. None of these hills is a volcanic crater, as has been asserted in some descriptions of the district, nor are they due to local volcanic upheaval. They owe their height above the surrounding country merely to the fact that they are composed of material somewhat harder or more durable than the average rock of the region and have thus succumbed more slowly to the general erosion that has carved the existing relief from a gently domed volcanic series. The superior resistance of the hills is in some cases due to the original character of the rock of which they are composed; in other cases to a capping of young and fresh lava, but by far the greater number of the smaller knobs that stud the district, of which Black Butte is an excellent example, are prominent because the rock has been hardened by local silicification in a manner that will be described in connection with the ore deposits.

The fact that much of the district is a rolling plain diversified by rocky knobs has an important bearing in a region where detritus tends to accumulate on all but the steepest slopes. In the Tonopah district, and especially in the Bullfrog district, there is generally a fairly definite line between steep, bare, rocky hills and the gentle alluvial slopes at their base. At Goldfield, however, the general gradients are so slight that detritus accumulates over much of the surface and interferes seriously with attempts to determine the distribution and structure of the underlying rocks.

The geological structure of Goldfield compared with that of most districts in which deposits of the precious metals are found is simple. The district is essentially a low, domical uplift of Tertiary lavas and tuffs resting upon a foundation of ancient granitic and metamorphic rocks. The erosion of this flat dome has exposed the pre-Tertiary rocks at a number of places in the central part of the district, and these outcrops are surrounded by wide concentric zones of successively younger formations. But while it is not difficult to recognize the broad bare outlines of the structure, this general idea requires modification in many particulars before it can be accepted as a satisfactory conception of the geology of the region, and it is in the study of these essential details rather than in complexity of the structure that the investigation of the district offers real difficulties. One of these obstacles, the extensive cloaking of the surface by gravelly alluvium or 'wash,' has already been referred to. Owing to the prevalence of this material the contacts between the various underlying rocks are seldom well exposed and are usually completely covered. While it would be a simple matter to map this detritus wherever it is thick enough to conceal the rock beneath it, the map thus made would be less useful to the miner than one in which an attempt has been made to show the distribution of the possibly ore-bearing rocks, observed facts being supplemented wherever necessary by inferences based upon all available data. In accordance with this general principle the areas of alluvium have been entirely omitted from the preliminary map and will be reduced to a minimum in the complete and final map. That some adjustment of geological boundaries will be demanded when mining operations determine the positions of contacts now concealed is, of course, to be expected; but it is deemed more important to present a helpful interpretation of hidden structure than to be content merely with cautious and unsuggestive adherence to visible facts.

Another obstacle to accurate and successful study of the region is the intensity, widespread distribution, and erratic character of the alteration that has affected rocks, some of which, even in a fresh state, could be distinguished from one another only by refined petrographic methods.

The oldest rocks exposed in the district are found on Columbia and Vindicator mountains, and are particularly noticeable on the southern slope of the former peak as conspicuous dark patches visible from Columbia or Goldfield. Originally thin-bedded limestones or calcareous shales, with subordinate beds of sandstone, the formation is now much contorted and metamorphosed. The calcareous beds have been changed to compact aggregates of quartz (jasperoid) crowded with microscopic black particles, probably carbonaceous, and the sandstone to hard, vitreous quartzite.

The metamorphism is apparently due to the intrusion of these sediments by masses of granitic rock composed essentially of quartz and orthoclase, a type for which Mr. Spurr has proposed the name alaskite. This rock is well exposed on Columbia Mtn. and makes up a large part of Vindicator Mtn. Smaller areas occur in the vicinity of Banner Mtn. Most of the alaskite contains a very little black mica and some paglioclase. In most exposures the mica is decomposed and scarcely noticeable, but northeast of the summit of Vindicator Mtn. the alaskite mass grades into a biotite granite.

The age of the alaskite and intruded sediments, beyond the fact that both are pre-Tertiary, can not be determined from any evidence available in the Goldfield district. Mr. Spurr, whose wide experience in southern Nevada renders his opinion of special weight, considers that the metamorphic sediments may well be Paleozoic and that the alaskite was intruded in post-Jurassic time. S. H. Ball, who recently made a reconnaisance over a large area around the Goldfield district, found Cambrian fossils in beds which he is inclined to correlate with those exposed in Columbia and Vindicator mountains.

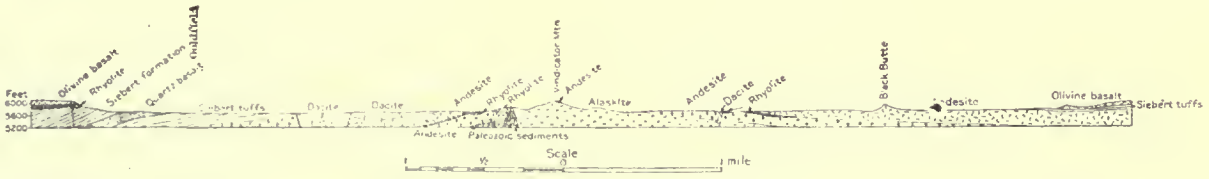
It is certain that the intrusion of the alaskite was followed by a long interval during which the region was eroded to the surface of moderate relief subsequently covered by the irruption of Tertiary lavas.

The sequence of Tertiary eruptions as shown by the rocks of the Goldfield district was as follows, the oldest rock being at the bottom of the column:

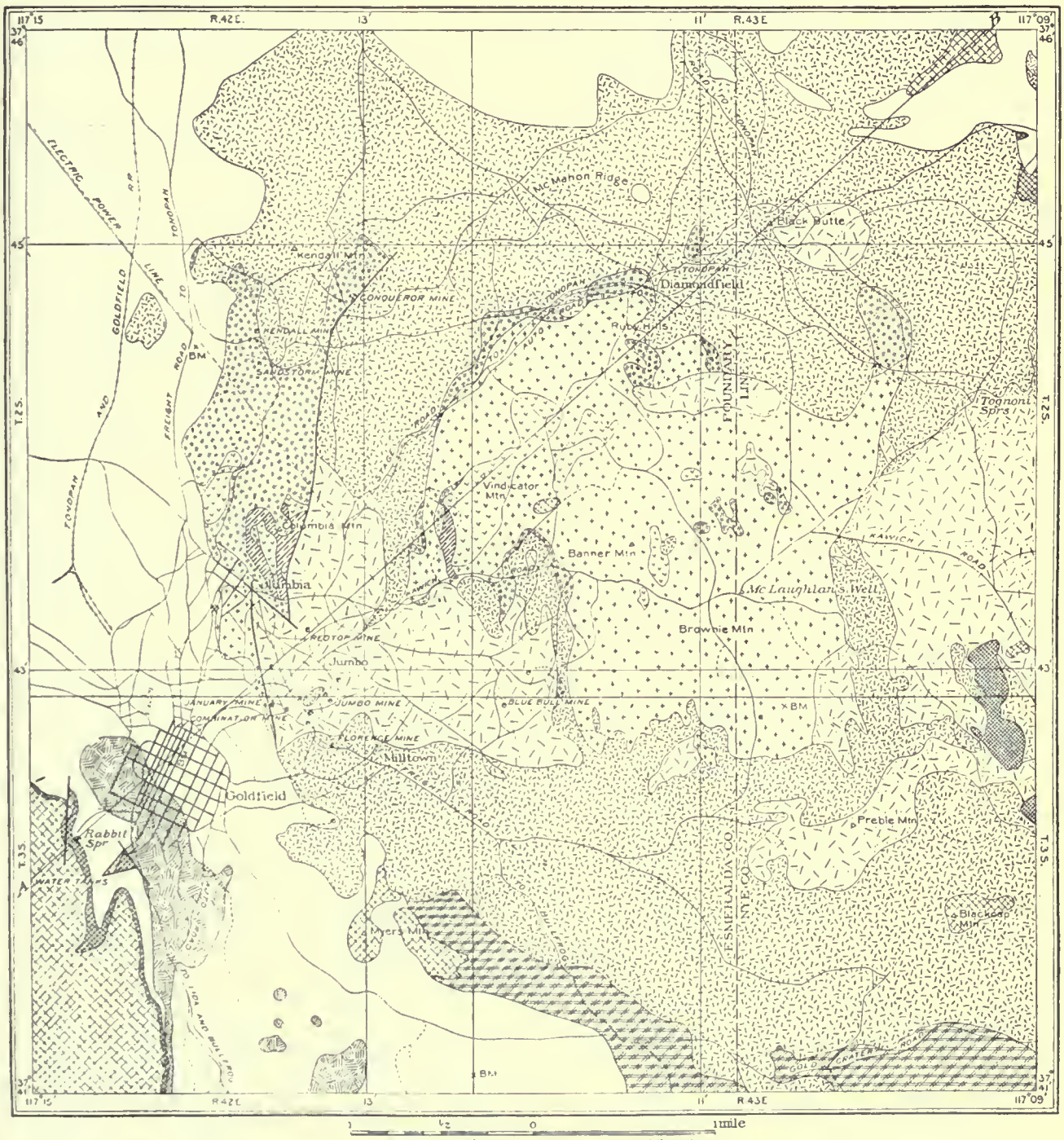
Olivine basalt; flow and small intrusive bodies.
Breccia and conglomerate.
Rhyolite; flow.
Lake beds.
Quartz-bearing basalt; flow intercalated in lake sediments.
Lake beds.
Latite and rhyolite; flows.
Dacite; sheet-like and irregular intrusions, possibly in part a flow.
Andesite; flows with some tuff and small intrusive bodies.
Rhyolite; intrusive masses.
Rhyolite; flows and tuffs.
Andesite; flow.

The older or first andesite, as may be seen from the map, occupies an area a little over two miles in diameter in the centre of the district, and a small area south of Columbia. Its characteristic features may be well seen in the vicinity of McLaughlan's well, on Banner Mtn., and on the southern edge of the town of Columbia. This rock has not been found in a fresh condition. Its color is usually dull purplish or greenish-gray. A spotted or mottled appearance, due to flow-brecciation, is rather characteristic and is well shown on a small hill half a mile north of the summit of Banner Mtn. The freshest obtainable specimens of the first andesite show pheno-

*Abstracted from Bulletin No. 303, United States Geological Survey.



Geologic section across the Goldfield district on line *A-B*



Olivine basalt. (Flows and small intrusions.)
Rhyolite. (Later flows.)
Siebert tuffs. (Lake beds including thin flows of rhyolite.)
Quartz basalt. (Flows interstratified in Siebert tuffs.)
Volcanic breccia. (Roughly bedded local deposit.)
Quartz latite. (Flows with some rhyolite.)
Dacite. (Intrusive masses.)
Andesite. (Later flows and intrusions.)
Rhyolite. (Earlier flow with intrusive masses and tuffs.)
Andesite. (Earlier flows.)
Alaskite. (Intrusive in Paleozoic sediments.)
Paleozoic sediments.

PRELIMINARY GEOLOGIC MAP OF THE GOLDFIELD DISTRICT.

crysts of feldspar, hornblende, and mica in a compact, streaky groundmass that was evidently once a glass with well-marked flowage lines. All the phenocrysts have the dullness that indicates more or less thorough alteration and the original glassy base is now devitrified. As a rule, the first andesite, when it has not been subjected to the intense local alteration connected with ore deposition, may be distinguished from the later andesitic rocks by the absence of fresh phenocrysts and the peculiar streakiness of its groundmass, which resembles the groundmass of a rhyolite rather than that of most andesites.

The rock is apparently a flow resting upon a clean and rather uneven surface of alaskite and Paleozoic sediments. Its thickness is not known, but it is probably very variable, as on Columbia Mtn. the succeeding rhyolite rests directly upon the alaskite. The maximum thickness is tentatively estimated as at least 400 ft., and it may be considerably more.

Overlying the first andesite, or resting on the pre-Tertiary rocks where the andesite is absent, is a series of thin, glassy, rhyolite flows which is best developed in the rounded white hills northwest of Columbia Mtn. This rhyolite is associated with pale greenish tuffs of mingled andesitic and rhyolitic character and is cut by masses of intrusive rhyolite. All these rocks are shown together, although they will be distinguished on the final map. The effusive rhyolite is usually nearly white, shows conspicuous flow lamination, and weathers in thin, shelly flakes. This is the rock of the Sandstorm mine and of the hills lying west of the road from the mine to Columbia. It all shows some devitrification and silicification, particularly in the vicinity of the ore deposits. Certain varieties or portions of this rhyolite acquired by flowage a very thin lamination, causing the rock when somewhat weathered to closely resemble indurated clay shale. This appearance is very deceptive, as may be seen at the Tonopah Club or Conqueror mine. The town of Diamondfield is partly underlaid by this shale-like rhyolite, and small residual patches of similar material are scattered over the surface of the first andesite. The rhyolite appears to have been thickest in the vicinity of Columbia Mtn. and to thin out to the southeast. None of it has been found southeast of McLaughlan's well.

The intrusive rhyolite occurs on the summit of Columbia Mtn., where it has locally a sheet-like form and constitutes the ridge extending north of the mountain to the Adams mine. It is intrusive into the shaly rhyolite at the Conqueror mine, and another small mass cuts the first andesite, alaskite, and pre-Tertiary black jasperoid on the west slope of Vindicator Mtn. Thin sections indicate that some of this intrusive rhyolite occurs also on the east slope of Vindicator Mtn., but owing to the intensity of the alteration in this vicinity it could not be separated in the field from the silicified first andesite. The tuffs associated with these early rhyolitic eruptions may be best examined along the southwest base of Columbia Mtn. and directly west of the Kendall mine. Underground they are exposed in the west workings of the 100-ft. level of this mine.

After the eruptions of the earlier rhyolites came the eruptions of the second andesitic period, which covered the region with successive flows of andesite, accompanied by subordinate layers of andesitic tuff. The products of these eruptions constitute the most extensive formation in the district. The total thickness of this deposit, as of most of the other volcanic formations in this district, can not be determined, owing to the slight deformation of the rocks, their poor exposures, the comparatively slight topographic relief, and the absence of persistent datum planes, such as may usually be found in stratified rocks. It probably lies between 600 and 1,000 ft.; but this is confessedly little more than a guess and is likely to be under rather than above the truth.

The petrographic study of the andesites has not been finished. The second andesite undoubtedly includes more than one flow. Preliminary examination indicates that any division based on the predominance of certain ferro-magnesian constituents—for example, augite andesite or hornblende andesite—would be artificial. In other words, the relative proportions of these minerals appear to vary in any one flow. Moreover, as the first andesite and pre-Tertiary rocks are cut by dikes and small intrusive bodies of the second audesite, the latter formation as a whole is probably a volcanic complex, in which are involved intrusive bodies, as well as flows and beds of tuff and breccia.

The dacite, whose eruptions followed the second andesitic period, is in many respects the most interesting rock in the district and is certainly the most important from the economic standpoint. It occupies a considerable area east of Goldfield and Columbia and is the principal country rock of the Combination, January, Jumbo, Red Top, and Florence mines. The surface at the main Florence shaft is the second andesite, and it was at first supposed that the ore also occurred in this rock. Microscopic study shows, however, that most of the altered country rock of the Florence below the zone of complete oxidation, although finer grained than the typical dacite, is really a variety of that rock, and consequently that the shaft penetrates the flat-lying andesite and enters the dacite. This mass of dacite appears to be an intrusive sheet dipping gently to the west and south and cut off to the west by faulting.

A larger body of dacite extends southward from Tognoni Springs and forms some of the high hills just east of the mapped portion of the district. This mass makes up a large part of Preble Mtn. Smaller bodies of dacite occur southeast of Black Butte and in the central part of the district.

The dacite, of which typical and fairly fresh specimens can be collected on the little hill 500 ft. northeast of the transformer station, has the appearance of an andesite. It is generally more conspicuously porphyritic than the andesites of the district, but its essential distinction from them is the presence of phenocrysts of quartz. These are always rounded by magmatic corrosion and as a rule are neither very numerous nor very conspicuous. The rock consists of labradorite feldspar, hornblende, biotite, augite, and quartz in the usual andesitic groundmass. Chemical analysis of the dacite shows that it contains 60% silica, or 2% more than a hornblendic andesite from the northeastern part of the district. Mineralogically and chemically the dacite at Goldfield is merely a quartz-bearing andesite.

The geological relation of the dacite to the andesite is not entirely clear. Its comparatively coarse porphyritic texture, the irregular outlines of its exposures, and the occurrence of small bodies of dacite within larger masses of andesite are all indicative of the intrusion of the dacite into the andesite. As a rule, however, the contact between the two rocks is not well enough exposed or the rocks have been too much altered in its vicinity to afford definite proof of this relation. At one point only, situated one mile N 35° E of the summit of Preble Mtn., a sharp intrusive contact is exposed between the dacite and the andesite. The dacite is glassy at the contact and penetrates the andesite in a way that shows the latter to be the older rock. Of course, this exposure merely proves that one mass of the dacite is intrusive into a certain mass of andesite. The general conclusion reached, that the dacite as a whole closely followed the

andesitic eruptions and was intruded into the flows and subordinate tuffs at moderate depth, is still in need of evidence for its complete establishment. It is probable that this intrusion was accompanied by some deformation of the region, and the andesite flows appear to have been somewhat eroded before the next eruptions took place.

After the dacitic intrusion a rock provisionally classed as quartz latite was erupted as a series of flows and is now extensively exposed in the low hills in the southeast corner of the district. This rock, which corresponds more closely than anything else in the Goldfield region to some of the Tonopah dacite, is in most places a porous light gray or greenish rock with abundant glistening scales of black mica and phenocrysts of fresh paglioclase, mostly oligoclase. In some varieties quartz and orthoclase are present, and some thin flows of vitrophyric rhyolite are associated with the quartz latite. Two areas of rhyolite in the northeast corner of the district are provisionally mapped with the latite. The quartz latite is easily worked, and a quarry opened in this material 1½ miles south of Preble Mtn. has afforded stone for buildings in Goldfield.

No traces of mineralization have been found in the latite, and the ore deposits of the district were probably formed prior to its eruption. This, however, is not definitely determinable, as none of the latite occurs in the immediate vicinity of known orebodies.

After the latitic eruptions the region was covered by an extensive body of fresh water in which were laid down 500 ft. or more of bedded conglomerate, tuff, tuffaceous sand, pumiceous ash, and diatomaceous earth. These deposits, the 'cement rock' of the miners, cover a large part of the district, particularly in its outskirts. They underlie the town of Goldfield and stretch both north and south beyond the limits of the area studied. They also extend beneath the 'malapai' (*malpais*) mesa southwest of town and are well exposed in the steep bluffs of the ravine in which are situated the city waterworks. The beds here dip generally westward at angles ranging from 25 to 30 degrees.

Although the lake beds appear to be locally conformable with the quartz-latite flows, yet as these are present beneath them in only a small part of the district, and as the formation of the lake indicates some change in the configuration of the region, there is at least a suggestion of erosion between the quartz-latite eruptions and the lacustrine condition. Volcanism continued active during the existence of the lake, as shown by the prevailingly volcanic nature of the sediments and the occurrence within them of a thick flow of quartz-bearing basalt and thin flows of glassy rhyolite. The quartz basalt, as shown by wells, underlies the southwestern part of Goldfield and is exposed on the automobile road to Bullfrog.

In the eastern part of the district, northeast of Preble Mtn., are some bedded breccias and tuffs from 200 to 300 ft. in present thickness. They rest upon dacite and andesite and are made up largely of fragments of these rocks, particularly of dacite mingled with abundant fragments of volcanic glass and some sandy tuffs. These beds are provisionally correlated with the lake beds just described.

Lacustrine conditions were ended by the deformation of the region, the domical structure being accentuated or possibly initiated by this uplift. After the lake beds had been beveled by erosion and probably entirely swept away from the central part of the district eruptions of rhyolitic lavas again began.

The latest rhyolite is a light pink or pale brown rock, rather porous and containing abundant pumiceous fragments. It forms a flow of about 100 ft. in maximum thickness, which is exposed in the bluffs southwest of Goldfield, under the dark volcanic rock which caps the mesa. It is this rhyolite that is quarried for building stone at Rabbit Spring. It is in some places overlaid by a few feet of unconsolidated tuffaceous sand and volcanic gravel.

Finally, the volcanic history of the region was brought to a close by the eruption of one or more flows of olivine basalt. This is the dark rock that is conspicuous as the capping of the mesa southwest of town. It also forms the summit of Myers Mtn., Blackcap Mtn., and several hills south and east of the area mapped. The larger areas of this rock represent remnants of flows which rest upon a nearly horizontal surface of older rocks; but some smaller masses, such as that shown on the east slope of Vindicator Mtn., are intrusive and may fill orifices through which the basalt reached the surface to spread out as flows.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Mineral sample from Ophir, Cal., marked O. T. W., is Graphite.

M. W. A., of Marysville, Mont., sends a piece of Limestone.

The mineral from Tehachapi, sent by F. A. F., is Chalcedony.

C. T. D., of Searchlight, Nev., sends specimen of Hornblende-Andesite.

The mineral from San Diego, marked W. M. J., is Magnetite, somewhat altered to Limonite.

The specimen from Santa Ana, marked W. H. H., is a Talc gouge, slightly graphitic; no value.

The black sand sent from Minersville, Cal., by G. H. W., is mainly Magnetite, with quartz and rock fragments. No platinum is visible.

The specimens from J. N. McL., of Denver, Colo., are: No. 1, Basalt; No. 2, a sulph-antimonite of copper and silver, probably argentiferous Tetrahedrite.

The rocks from Brayton, Ariz., marked R. McM., are: No. 1, Biotite-Granite; No. 2, Porphyry; No. 3. Breccia; No. 4, kaolinized rock stained by copper silicate.

Rocks from Grizzly Flats, marked F. C. B., are: No. 1, serpentinized metamorphic rock containing cubes of Pyrite; No. 2, Quartzite with Pyrite; No. 3, Gneiss with Pyrite.

The specimens from Caliente, Cal., marked C. F. B., are: No. 1, Pyrite in a decomposed Schist; No. 2, Quartz stained with Limonite; No. 3, Arsenopyrite; No. 4, Pyroxene rock with Pyrrhotite, Graphite, and Chalcopyrite.

The rocks from Wonder, Nev., marked W., are: No. 1, Quartz-Breccia, containing fragments of Chert and volcanic rock; No. 2, Quartz rock with the silver minerals, Cerargyrite and Argentite; No. 3, Rhyolite-Porphyry; No. 4, Granite-Porphyry; No. 5, Rhyolite; No. 6, Andesite; No. 7, Rhyolite; No. 8, Biotite-Porphyrite, containing Epidote.

How the Miner's Dynamite is Made.—III.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

The second half of the manufacture of dynamite consists in incorporating the nitro-glycerine with the 'dope' and in packing the product. The dope for ordinary dynamite consists of wood pulp (such as is used in the manufacture of paper), which is used to absorb the nitro-glycerine; precipitated carbonate of magnesia, which is added to neutralize any possible acidity in the nitro-glycerine or any acidity which might develop in the powder during storage and perhaps cause a spontaneous explosion; in some grades a little flour ('middlings') is used; and there is a liberal allowance of ground sodium nitrate (Chile saltpetre) for the purpose of oxidizing the wood-pulp and 'middlings.' It forms with them an explosive analogous to gun-powder.

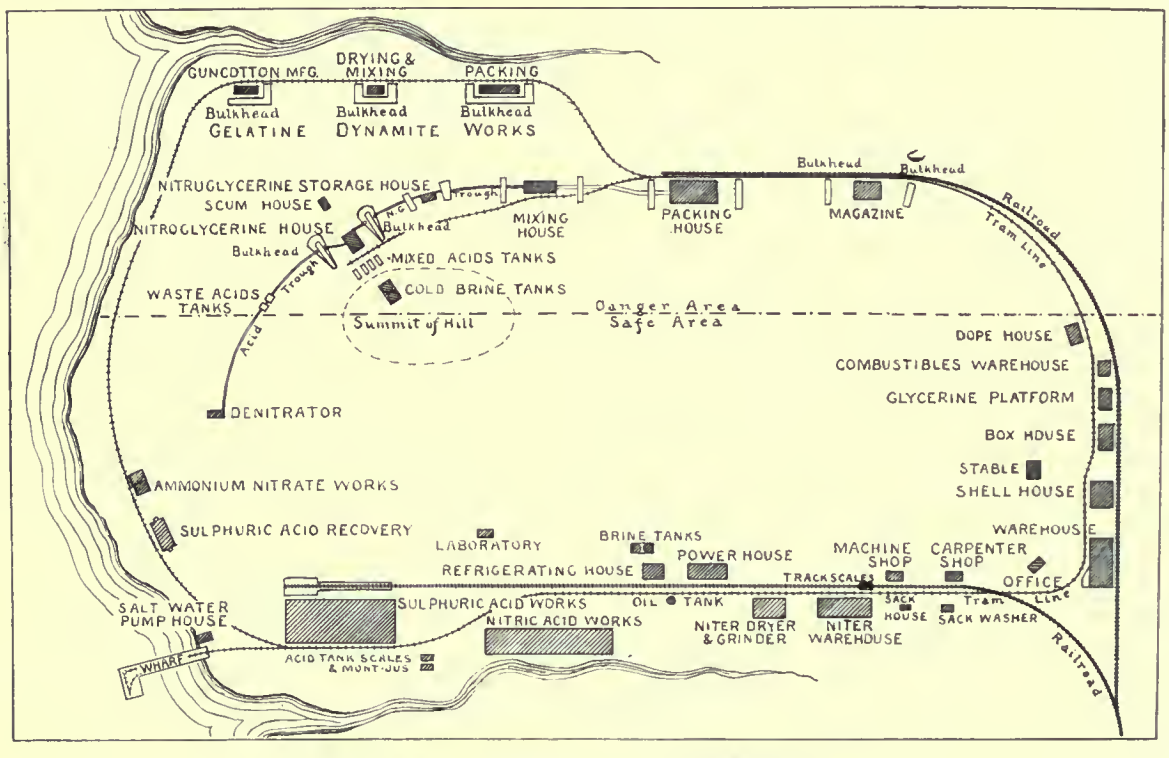
Hand-mixing is done in lead-lined troughs about 10 ft. ong, 3½ ft. wide, and 2½ ft. deep. The ingredients of the dope are sifted into the trough through a coarse sieve and mixed together. The nitro-glycerine is brought to the mixing-house through a lead or rubber-lined trough to a lead storage-tank. The amount required for mixing is weighed in a tank-scale, pushed to the mixing trough and run in through a rubber hose. The materials are then turned over with wooden spades until the mass is fairly even in appearance. It is next stacked up at one end of the trough and worked through a coarse sieve resting on the trough at the other end, being worked through by a reciprocating top covered with bristles. The sifting is repeated till the powder is of the proper texture.

Power-driven mills have been used for some years for the first part of the mixing and will soon be running at all the powder works. They are about 10 ft. diam., made of wood and hard rubber, and look like a four-wheel Chilean mill, except that the wheels are suspended a little above the bedplate and do not touch it at all. The powder is merely pressed down a little and a plow that follows each wheel turns the material over. These machines do the heavier part of the mixing, which is then completed by sifting by hand in the mixing-trough, as before.

The Vigorit Judson Works has lately added a special 'dope-house' in which the ingredients of the 'dope' are weighed and mixed. The latter is then conveyed to the mixing-house and incorporated with the nitro-glycerine. This arrangement keeps the mixing-house cleaner from the flying dust of the dope and allows that much work to be done at a distance from any danger of explosion.

Ninety per cent dynamite is made by mixing the nitro-glycerine with *kieselguhr*, a silicious earth composed of microscopic shells that absorb the liquid. It is not made on the Pacific Coast.

Kieselguhr was formerly much used in making dynamite, but it has been crowded out of use by wood-pulp. The latter acts as an absorbent and at the same time forms an explosive when in contact with the nitre that is put into the dope, thus adding to the strength of the powder. The highest grade of dynamite that is made with wood-pulp is 75%. The highest grade that is called for in quantity is 70%. Three different qualities of wood-pulp are used in making dynamite, those for the higher grades having more absorptive power. A special quality is imported from the East, but the grade principally used is made here in California.



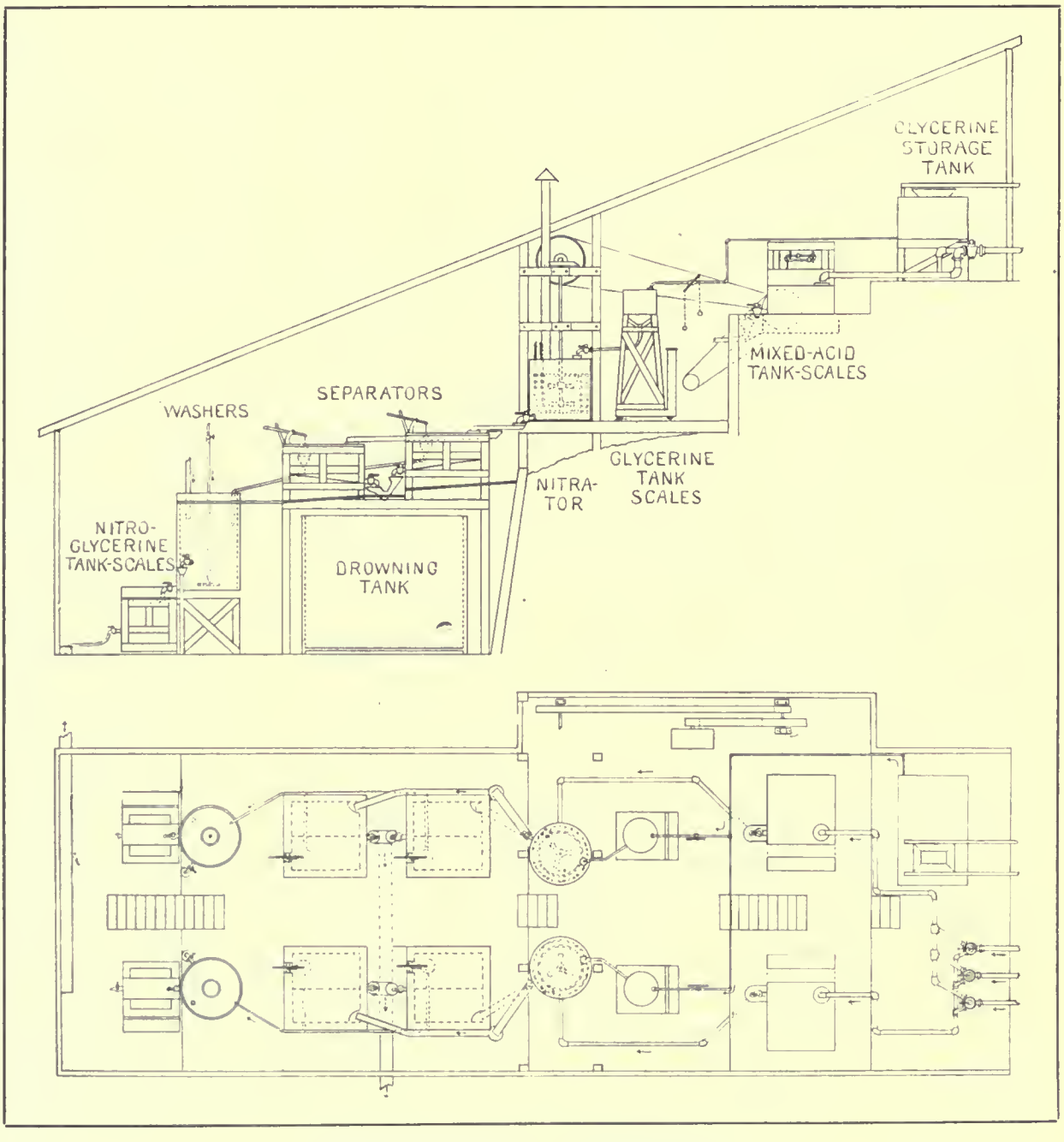
Arrangement of Buildings in a Dynamite Manufactory.

The essentials of a good powder are that the nitro-glycerine must have been washed entirely free of all acidity, and must contain a minimum of moisture, which, in the higher grades, may cause the nitro-glycerine to exude. The powder should contain a liberal supply of nitre for the purpose of thoroughly oxidizing the wood-pulp and 'middling' present to water and carbon dioxide. Carbon monoxide is much more deleterious in a mine than the dioxide. And lastly, what is generally considered most important of all, the powder should be mixed and packed to the proper consistence. In theory the most perfect explosive would be made if the nitre were ground very fine, so as to make an intimate mixture with the wood-pulp, but in practice such fine grinding seems to give less satisfaction. The powder is apt to pack into hard sticks in the packing machines, whereas the men I have worked with in the mines have always preferred a medium consistence, so that the powder will tamp well in the drill-hole. Furthermore, in the lower grades, a very dense powder might sometimes miss fire with an

XXX cap. After changing to medium grinding at the Vigorit, our powder gave excellent satisfaction and we never had a complaint. Different customers occasionally prefer dynamite of different density, and as we were always behind hand and packing 'to order,' we used to tell our packing-house forman to pack 'medium,' or 'soft,' according to what we knew of our customers' preferences.

All the four powder works on the Pacific Coast are today using practically the same formulas for the different grades of dynamite. What differences there are, are more carefully than the other grades, which never possess that fault.

After the nitro-glycerine has been mixed with the 'dope,' the meal is pushed in wooden cars to the packing-house, and is shoveled as needed into the trays of the packing-machines. The paper shells for the sticks of dynamite are rolled by hand in the shell-house by girls, who become wonderfully expert at the work. Some of them can stamp, roll, and paste as high as 8,000 in a day. Three years ago a machine was erected for rolling the shells, and machines will soon displace hand-labor. This



Nitro-glycerine House of a Dynamite Manufactory.

immaterial, and if the powder were packed to a density that suited me, I would just as soon use one brand as another. I give below the formulas for the principal grades of ordinary dynamite:

	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Nitro-glycerine	70	60.0	50	40.0	30.0
Wood-pulp	20	16.5	14	11.2	4.2
Ground sodium nitrate	7	22.5	35	46.2	60.0
'Middlings'	...	....	...	2.2	5.8
Precipitated magnesium carbonate	3	1.0	1	0.4	.....

In the 70% grade a little of the nitro-glycerine occasionally exudes upon the wooden packing case; therefore it is always well for miners to handle the 70% cases

will be an advantage to the works in more than one way, because it has not always been easy to get sufficient girls at the powder works, which are necessarily out of town. The shells are dipped, one hundred at a time, in molten paraffine wax, and are then allowed to stand at steam heat a few minutes to drain. After cooling they are conveyed to the packing-house.

The packing-machines in common use were invented by Col. W. R. Quinan, when manager of the Vigorit works many years ago. He afterward became manager of the California Powder works at Hercules, and from there went to the large dynamite works in South Africa.

The powder is packed by a series of wooden plungers—14 when packing 1¼-in. and 17 for the ⅞-in. size. The paper shells are placed in wooden molds to keep them from bursting under the tamping. The plungers are worked in unison by a bar and two levers in the hands of the operator, and ram the powder a little at a time. Some revolving pegs keep the meal stirred up and feeding properly. When the sticks are full the mold is removed by hand, the ends of the paper shells are pinched over, and the mold is then opened and the sticks of dynamite spilled upon a table. They are then packed in wooden cases, tried on a scale for net weight, and nailed up with a brass hammer. It takes seven men besides the boss to keep two machines busy, and each machine packs about 60 cases (50 lb. each) of ⅞ by 8 in. and 85 cases of 1¼ by 8 in. Large machines, power-driven, are now being built and will pack five times as much. Chinamen are commonly used for the hand-mixing and the packing, but they are not allowed in any other part of the works.

Gelatine dynamite is a variety that has gained greatly in popularity in the last few years. It is made by mixing a little 'soluble' gun-cotton with the nitro-glycerine, the gun-cotton having the property of turning the nitro-glycerine to a jelly. The 'dope' is then added, about the same as for ordinary dynamite. The mixing is done in a complicated power-driven mixing machine. 'Gelatine' in the name signifies that the nitro-glycerine has been gelatinized; it does not mean that there is any gelatine in the mixture. 'Forty per cent' gelatine dynamite contains 36% nitro-glycerine and 1.2% gun-cotton. The tetra and penta-nitrates of cotton are used, and not the hexa-nitrate, which is the ordinary variety of gun-cotton. The Judson works used to buy their gun-cotton from the California Cap Co. near-by, where it is made for mixing with fulminate of mercury and potassium chlorate in making blasting caps.

Gelatine dynamite cannot be packed in the Quinan machines, as they are made to handle a meal and not a dough. It is fed into a pyramidal worm, revolved by a handle, and is forced out as an endless cylinder at the small end of the machine, just as though it were a sausage. It is cut into sticks eight inches long and the paraffine paper is then rolled about it by hand.

Gelatinized nitro-glycerine is almost as waterproof as rubber and when placed under water it will not separate from its 'dope' as plain nitro-glycerine does. On account of its jelly-like consistence it is particularly valuable for tamping into 'upper' holes in wet mines, and the greatest demand for it comes from Colorado. California uses little of it.

The latest variety of dynamite, and one with which Pacific Coast miners may ere long become acquainted, is an improved form of ammonium dynamite. Ammonium nitrate is both an oxygen carrier and a substance that is easily decomposed into gases, without leaving any solid residue, as sodium nitrate does. Thus it makes a valuable component of an explosive, if properly employed. The difficulty of using it has been that it is strongly hygroscopic, that is, it attracts moisture from the air, just as kitchen salt does in a more moderate degree. Ammonium nitrate has been specified in patents on explosives, but generally it has been named together with tar, paraffine, nitro-benzol, or some waterproofing material that would coat the grains and keep them from contact with the moist air. Many experiments with ammonium dynamites were made on this Coast by my old friend, Chas. D. Kennedy, who was killed by an explosion while superintendent of the Judson works some years ago. Associated with him as chemist was N. L. Neilson, Jr., now superintendent of the Vigorit-Judson works. Both these men were most enthusiastic over the results they obtained. Lately a method has been invented of protecting the ammonium nitrate particles by incorporating a little vaseline, which is better for the purpose than the waterproofing compounds mentioned above. By this method ammonium dynamite is now being made both in the East and on the Pacific Coast, and thus far appears to have given excellent satisfaction. To give you an idea of its composition I will quote one of the Kennedy-Neilson formulas:

	Per cent.
Nitro-glycerine	25
Nitrate of ammonia	20
Wood-pulp	15
Nitrate of soda	40

This dynamite is equivalent in strength to an ordinary dynamite having 40% nitro-glycerine, and it can be manufactured for about one cent less per pound—not allowing for any patent royalties.

'Stump' or 'stumping' powder, much of which is sold on the Coast, is a 20% dynamite. It is made with 5% wood-pulp, 50% ground nitre, 20% ground coal, and 5% sulphur. It is a valuable explosive where a bursting rather than a shattering effect is desired. It is packed in two-inch cylinders 4 in. long, by ramming it into the paper shell through a funnel, without the use of machines.

'Low' powder is a 5% dynamite. It is packed loose in 50-lb. cases and can be poured into a churn-hole like black powder. It contains 5% nitro-glycerine, 70% ground nitre, 18% ground coal and 7% sulphur. The Judson 'low' contains 5% nitro-glycerine, 640 lb. nitre, 150 lb. ground coal, and 160 lb. sulphur.

Dynamite is most commonly tested at the works by placing a weighed charge beneath a heavy weight and measuring the effect in flattening a standard button of lead one inch in diameter and one inch long. The machine used for the purpose is known as the Quinan testing gun. A number of measurements are made with a micrometer upon the little lead cylinder, before and after firing the charge, and the averages are compared with the effects of a standard explosive, such as 90% Kieselguhr dynamite or a weighed quantity of nitro-glycerine. The dynamite is also examined by extracting the nitro-glycerine with solvents, such as ether, in the familiar Soxhlet's apparatus, purifying, and determining its weight; or by other analysis. The Mexican law requires the percentage of nitro-glycerine in dynamite to be within 2/10 of 1% of the mark, and it is not a bad law either. If a miner received 38% instead of 40% dynamite he would be paying more than half a cent a pound higher, comparatively. I am glad to testify, however, that as far as I know, the business has always been honorably conducted in the matter of living up to the label. The only exception is in the gelatine dynamite, where as shown above, 'forty per cent' means only relative strength and does not mean that there is 40% nitro-glycerine in it. During the days of the 'pool' some years ago it was customary to analyze samples from the different companies' shipments to make sure that the dynamite did not contain *more* nitro-glycerine than was stated on its label. Billing 40% dynamite as 35% would, of course, have been equivalent to a cut in the price.

Nitro-glycerine is a poison and acts on the system when used either externally or internally. Dissolved in alcohol it is known as 'spirits of nitro-glycerine,' or glonoin, and is official in the pharmacopœia. It is used in minute doses for stimulating the action of the heart.

The workmen in the nitro-glycerine house wear rubber gloves to protect their hands from the nitro-glycerine and acids. A headache may be obtained from nitro-glycerine in three different ways. If it is brought in contact with

the skin some of it is absorbed into the blood, generally producing a violent headache, which often lasts as long as three days. The same result follows with some men if they breathe the slight fumes that arise from nitroglycerine, especially when it is standing in the separators.

After the dynamite has been exploded, the gases of the explosion, consisting mainly of carbon dioxide and carbon monoxide, will cause a headache, and the smoke of the explosion is the only cause that the miner ordinarily thinks of. In this the monoxide is the greatest sinner, and it is for the purpose of thoroughly oxidizing the wood-pulp to the dioxide that so much nitre is used in the 'dope.' Some men soon get used to nitro-glycerine, so that they can handle it with impunity. The Chinese mixers and packers, for instance, get their hands oiled by it every day without its affecting them. But our superintendent at the Vigorit once stayed away from the works for six weeks and when he returned he got a 'powder headache' as though he had never been in the business before.

Because the manufacture of dynamite is a dangerous business mining men generally seem to consider that, therefore, it must be highly profitable, but that does not follow. It is now a better business than formerly, thanks to the improvements I have described. But a few years ago, when glycerine and nitre were both 'up,' the largest works on the Coast made a profit of less than half a cent per pound on 40% dynamite, and the smallest works made nothing, no allowance being made for depreciation and insurance in either case. Dynamite cannot be manufactured under favorable conditions in a plant producing less than 500,000 lb. per month. And good results can be obtained only by the most scrupulous attention to every stage of the process. The price of 40% dynamite at San Francisco has generally been 2c. per pound less than the price in New York, and scales, laboratory, and slide-rule have to be kept ceaselessly in operation if the best yields are to be maintained. The business has outgrown its early days and has now become systematized, exact, interesting, and, *ergo*, at last profitable.

The manufacture of dynamite should not be confounded in these results with the manufacture of smokeless powder, or of black powder. The California Powder Works manufactures both black and smokeless powder at its Santa Cruz plant, and the Giant Powder Works owns a black powder plant at Clipper Gap, Placer county, which is shut down by agreement. Both these classes of explosives are of small production when compared with dynamite, but their margin of profit on the Pacific Coast has been comparatively large. The price of black powder in carloads has been maintained at $1.50 per keg, whereas it is sold on the Atlantic side for less than $1. Similarly the price of smokeless, which is more or less hedged in by patents, is also maintained far above its actual cost. But dynamite, being of large production, and having had its price set in days of considerable competition, has never had any hot-house prices to flourish in. It has been brought to a position where its manufacture yields a decent reward for the application, skill, and risk that it demands, solely through the long chain of improvements introduced by its managers and employees.

In regard to the effect of the 'trust' upon the business it has taken over, I can testify, so far as the Coast companies are concerned, that it has been altogether for the good. Improved methods have been put in force, and machinery has been introduced that the managers wanted years ago, but which foolish boards of directors, whose principal hours were spent in other lines of business, did not think could be afforded. Under the Dupont 'trust' the managers of the different works in the United States are sent upon visits of inspection to the other plants. Reports are kept on the same form-sheets at all the works, and all reports are distributed to all the managers every month. Thus each manager is able to compare his yield of nitric acid, or of his de-nitrator, or the cost of packing his dynamite, with the cost at every other works in the combination. Profits have been increased, salaries have been increased, and wages of the best workmen have been voluntarily raised. The result of combination in other lines of industry may or may not have been of advantage to the country, but in the dynamite business the results, thus far, are unquestionably good. The investors receive more, the employees receive more, the plants are better, and therefore there is less risk of loss of life than there was before, and still the miner is able to buy his dynamite at the same old price.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The owner of a mine was not liable for failure to furnish timber to be used as props to prevent a roof from caving in, as required by statute, where the person injured was an experienced miner, who knew the danger and continued to work in the dangerous place, after his demand for timber had not been complied with.

Patterson Coal Co. *v.* Poe (Ark.) 99 S. W. 538.

In an action to quiet title to a mining claim, the plaintiff must show that either he himself, or the persons from whom he claimed under a prior location, had performed ten days' worth of labor or improvements made by the 10th day of January of each year, for each 100 ft. in length along the vein until a patent was issued, and a failure to show such work or improvements in any year will prevent a recovery.

First Nat. Gold Min. Co. &c. *v.* Altvater, 149 Fed. 393.

A co-owner of a mining claim may, by *ex parte* proceedings, forfeit the interest of his co-tenant for failure and refusal to contribute to the necessary assessment work as authorized by statute. But such proceedings will be ineffective where no assessment work was in fact done as alleged in such proceedings. A court has power to review the representations made to the Land Department by a co-owner of a mining claim, to the effect that the other tenant had not contributed his share of the representation work during certain years, and that the applicant had published the notice provided by statute. And where the Court found that such representations were false, and that since the ground of forfeiture did not in fact exist, the mere publication of the notice did not conclude the co-tenant and was not effective for any purpose.

Delmoe *v.* Long, (Mont.) 88 Pac. 778.

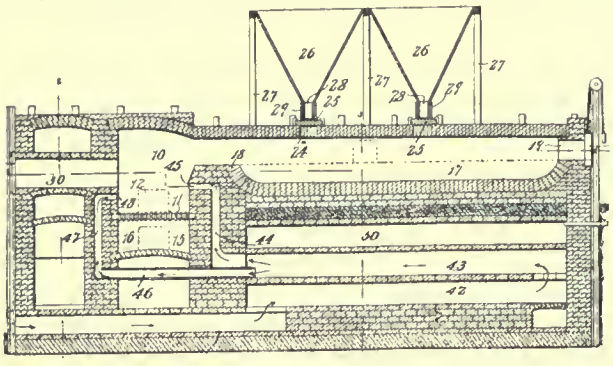
A purchaser of mines took possession and continued working the same. Within four months he learned that material misrepresentations had been made by the vendor as to the value and richness of the mines, but continued to operate the same for development and production for two years, until after suit had been commenced by the vendor to foreclose a mortgage given to secure the purchase money. No notice of an intention to rescind on the ground of the fraud had ever been given. The Court ruled that such delay and laches amounted to a waiver of the right to reseind, yet the purchaser could plead the resulting damages because of the fraud, as a failure of consideration as a defense to the action on the note given for the purchase money. But the purchaser, under such circumstanees, where he had not fully performed the agreement on his part, could not, with full knowledge of the vitiating fraud, continue performance, voluntarily subjected himself to damages, and then recover therefor.

Richardson *v.* Lowe, 149 Fed. 625.

MINING AND METALLURGICAL PATENTS.

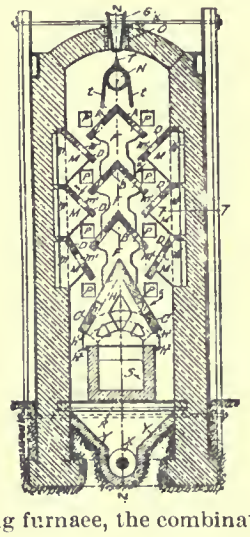
Specially Reported for the MINING AND SCIENTIFIC PRESS.

FURNACE.—No. 847,962; Harrison B. Meech, New York, New York.



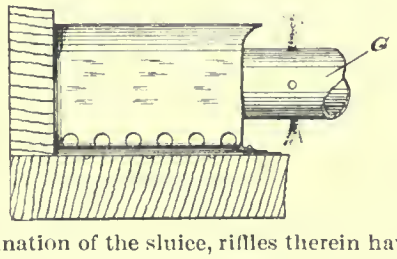
In an ore-smelting furnace, the combination with a reverberatory furnace-bed, of a cumbustion-chamber, a bridge-wall separating the furnace-bed from the combustion-chamber, a retort having its discharge end opening through the front wall of the combustion-chamber, and air-heating flues arranged below the furnace-bed, there being air-discharge openings in the front wall of the combustion-chamber at a point below the retort, said openings being in communication with the air-heating flues.

ORE-ROASTING FURNACE.—No. 847,756; George H. Franklin, Boulder, Colorado.



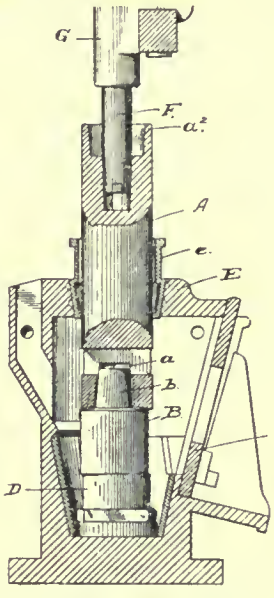
In an ore-roasting furnace, the combination of a roasting-chamber, a series of inclined shelves, of successively greater inclination from top to bottom, arranged one above the other within and extending from end to end of the chamber; with oppositely inclined shelves on the opposite sides of the chamber alternating with the central shelves, a feed-inlet at the upper end of the chamber, an outlet-pipe below the inlet and a divider and spreader interposed between the outlet-pipe and feed-inlet.

RIFFLE.—No. 847,519; John B. Sloane, Los Angeles, California.



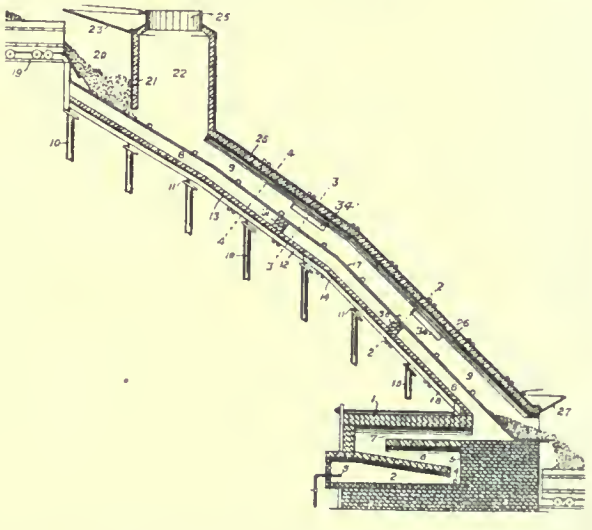
The combination of the sluice, riffles therein having vertical members, flat-bottomed members, curved top-members, said riffles being provided with perforations near the junction of the vertical and bottom members, also pipes in said sluice below the plane of the top of said riffles, said pipes having a series of perforations circumferentially spaced to project jets of water in opposite, that is to say, substantially vertical and horizontal directions.

STAMP-MILL STAMP-HEAD.—No. 847,397; Martin P. Boss, San Francisco, California.



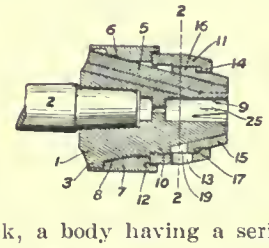
In combination with a mortar, having a cover with an anti-splashing housing, and a fixed guide above, a stamp-stem fitted in said guide, and a stamp-head fitted to the stem, and playing through the cover-housing, said stamp-head having an annular flange prolonging its upper end and adapted to pass over the fixed guide when the stamp-head is lifted.

MERCURY RETORT AND FURNACE.—No. 847,399; Conrad F. Brown, San Jose, California.



In a furnace of the character described, the combination of a combustion-chamber, a flue therefore, and a chute for the ore extending over said flue, the top of the flue forming the bottom of the chute, the walls of the flue and chute being formed at suitable intervals in their length with passages to permit the gases to pass from the former to the latter, and means for feeding the ore at the top of the chute.

DRILL-CHUCK.—No. 845,773; Lewis T. Gauss, Rochester, New York.



In a drill-chuck, a body having a series of converging grooves, a series of jaws having screw-threads, a screw-threaded part having threads for engaging the threads of said jaws whereby the jaws may be moved longitudinally in said grooves, and a rotatable cam-ring held on said body and having internal cams for engaging the backs of jaws

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Editorial.

FOR THE CONVENIENCE of the men in our composing room, we have prepared a style sheet, which has been printed in pamphlet form. Any of our readers or contributors that care to have a copy of it for their own use can have one on request.

FILING SYSTEMS are numerous. The card index has simplified them and has permitted of a thoroughness previously attained only by laborious effort. On another page, Mr. Walter S. Brown gives a lucid explanation and illustration of a system intended mainly for the use of mining engineers.

DISCUSSION on sampling and assaying is always useful. In this issue we publish two contributions by experienced men on a phase of the subject recently brought into notice by one of those who had been nonplussed by contradictory results. Other readers are invited to give excerpts from experience.

A DESCRIPTION of a large smelting plant by the members of its technical staff is a document worthy of preservation. We have taken pleasure in abstracting a portion of such a description prepared by the gentlemen at Anaconda, who, under the leadership of Mr. E. P. Mathewson, have made the Washoe plant an example of good metallurgical practice.

AMONG THE ABSURDITIES of the present era is the idea that those who write about mines are necessarily good judges of them; many newspaper reporters have been misled by their fatal facility with the typewriting machine to suppose that they knew something about practical mining and the valuation of mining property. We read in *The Journal* of Baker City, Oregon, that a gentleman who "has been in the newspaper business for 10 years" and "has worked the biggest press syndicate in the country," has expressed an opinion on the Goose Creek copper district. It is stated that the gentleman's "opinion carries weight." We demur to that, the more so as it is further recorded that "he returned to Baker City wild with enthusiasm." "Exceeding his wildest dreams of wealth, the newspaper man was hardly ready to believe his eyes when he saw two miles of solid red metal lying on the earth before him." Mr. Journal, of Baker City, Oregon, we are surprised at you! Such balderdash! For we happen to have accurate information concerning Goose Creek. A trustworthy mining engineer writes to us, saying: "The mines have been known and worked, to cover assessments, for a great many years. Not one ton of ore has ever been shipped from them, and there was not one ton

of shipping ore on the six dumps I inspected at that time, nor has there been any development since then warranting the least statement as to values beyond prospects." Wherefore the enthusiasm of the Chicago newspaper man? Was it the expectation of using the press syndicate to boom the stock? There is a confusion of ideas lurking at Baker City. It is one thing to examine a mine and another to manage a press syndicate; at the present time there are lots of people who think that the working of a press syndicate to boost trash is mining. It is something altogether different, and closely akin to larceny.

Director of the Geological Survey.

TWO of our contemporaries have made the mistake of announcing that Mr. Frederick H. Newell has been appointed director of the United States Geological Survey, this statement being based on an erroneous press dispatch. Mr. Newell is chief engineer of the Reclamation Service, and it is of that bureau that he has been appointed director, the Reclamation Service having been separated recently from the Geological Survey, much to the advantage, we believe, of the latter. Although Mr. Charles D. Walcott has resigned as director of the Survey, to accept his appointment as secretary of the Smithsonian Institution, he is exercising supervision over both these scientific departments and is likely to do so until July, at least. Mr. Charles R. Van Hise, the president of the University of Wisconsin and the distinguished author of the treatise on 'Metamorphism,' has been urged to accept the post, but he has signified his desire to remain where he is, in order to give his services to the guidance of a broad educational movement in the upper Mississippi Valley. Mr. Willard S. Hayes, of whom we spoke on a recent occasion as having received the cordial endorsement of many of his colleagues, has strong support from within the body of the Survey and he has for several years acted as Mr. Walcott's assistant, a large part of the responsibilities of executive work having devolved upon him.

Another geologist mentioned for the office is Mr. W. B. Clark, of Johns Hopkins University, who has so successfully managed both the Maryland Survey and his own department in the university. He is leader of the State Geologists in the East and is considered to be a man thoroughly competent for the Federal office. Among the younger men Mr. Charles K. Leith and Mr. George Otis Smith are mentioned. Mr. Leith is well informed concerning the requirement of geological work in the West, having done some of the best of it himself. Mr. Smith is now in charge of the Petrography section of the Survey and of pre-Cambrian geology in New England. He is a vigorous man, with a broad training and unusual business capacity. Others have been mentioned and among them some of our more immediate friends, but it is from the names already given that a director is most likely to be chosen. We have referred to the subject because it is one of general interest to those engaged in mining; in fact, it is a good augury for the future of the Survey that the people living in the mining regions take so keen an interest in the successful administration of this scientific bureau. We hope that whoever the new director may be, he will escape the merely political and beaureaucratic tendencies that threaten all governmental efforts to direct scientific investigation and that, as far as possible, he will return to first principles—the splendid purpose and enthusiasm for science that marked the first organizer of the United States Geological Survey—Clarence King.

Since writing the above we have been advised that Mr. George Otis Smith has been selected as director. This appointment will give general satisfaction. Although only 36 years old, Mr. Smith is a man of experience in large business affairs. For nearly ten years he has been administrator of the Coburn estate and in that capacity he has done well. Therefore his administration of the Survey is likely to prove efficient. As he has been working with the Keep commission, he is thoroughly alive to the need of doing away with much of the red tape that entangles work at Washington. Moreover, and by no means least, Mr. Smith is a man of charming personality, so that he is likely to get cordial assistance from the men associated with him. To those that are engaged in mining in the West, it is gratifying to know that the new director is a man of no local experience, having done geological work in Utah, Michigan, Washington, North Carolina, and New England. Originally a petrographer, he has done his share of general and economic geology. We trust that under his administration the Survey may continue to grow in usefulness.

IN *The Bendigonian* we read that both the Federal and State Governments of Australia are taking steps to aid the repatriation of those Australians in Africa who are out of work and desire to return. The cost of bringing back 1,000 Australians is estimated at $35,000, which looks like a good investment on the part of their homeland. It bespeaks a worthy spirit.

WE OBSERVE that the Wellington Association, a group of philanthropists organized to sell mining shares at a price that puts them within the reach of all, has decided to be generous. The price of the Development stock "was advanced to 25 cents a share on February 28. It will soon be selling for 50 cents." A circular proceeds to say: "On account of the unavoidable delay in getting our February Success to our stockholders and clients, which did not give intending investors time to get in their orders by the time specified; we have set aside 100,000 shares of Wellington Development stock which we will furnish to that extent to the first orders received at 15 cents a share, payable $10 a month on each 1,000 shares." Of course, this offer is not intended for able-bodied men that can earn a living by attending to business, but for the orphans and widows, who are in want of help and are likely to get it from such generous distributors of gilt-edge investments. And the poor things that buy stock at 15 cents that is sure to go to 50 cents *soon*, are called 'investors.' In the dictionary of the impolite, they have another name.

By the Way.

At a recent meeting of the Royal Geographical Society of Cornwall, Mr. Richard Pearce delivered an address. Among other interesting things, he said:

I have recently been afforded an opportunity of comparing the relative value of the annual production of black tin, with the crude arsenic obtained by roasting the concentrate, at Dolcoath, from the year 1850 up to 1887, at which latter date, it appears, the sale of arsenic had entirely ceased. This indicates the gradual disappearance of arsenical minerals as depth is attained. The following condensed table shows the percentage value of arsenic sold, as compared with the sales of black tin:

	Per cent.
1850 to 1859	2.01
1860 to 1869	0.94
1870 to 1879	0.35
1880 to 1887	0.28

It has occurred to me that some additional evidence bearing on the association of tin with pyritic minerals might be of some interest, and I have been able, through the kindness of the manager of Dolcoath, to obtain samples of crude ore from five different points of the deepest workings in that mine ranging from the 440 to the 490-fm. levels. These samples, No. 1 to 5 inclusive, represent 275 tons of ore sent to the stamps, and may be taken as a fair average of the ore produced at those points. A careful determination of the sulphur contained in these samples has been made under my own personal supervision, with the following results:

	Depth. Fathoms.	Sulphur. %
No. 1	440 to 455	0.24
No. 2	455 to 470	Trace
No. 3	455 to 470	0.021
No. 4	490	0.053
No. 5	490	0.026

A careful examination of the samples that gave marked evidences of sulphur, especially No. 1, showed that the sulphur was evidently combined with iron in the form of ordinary iron pyrite, there being no evidence of arsenical pyrite, so that it may be said that in all the samples there was an entire absence of this latter mineral. If we then assume that the sulphur, as before suggested, is in combination with iron as iron pyrite, the following will represent the percentage of this mineral present:

No. 1	0.45	per cent iron pyrite.
No. 2	Trace	" "
No. 3	0.039	" "
No. 4	0.099	" "
No. 5	0.048	" "

The mean percentage of these five samples will be 0.126 iron pyrite, and if we omit No. 1 from the most shallow of these depths, we have a mean of 0.046% only. These results, I think, substantiate my view that the average of the crude ore produced from the mine would contain the insignificant "quantity of 0.0178% of iron pyrite." The above results, I think, prove most conclusively that pyritic minerals are not necessarily accompaniments of tin, as far as indicated in the particular case of the deep workings at Dolcoath.

In considering the question of the probable source of metallic ores, it may not be out of place for me to refer briefly to the formation of minerals by what may be termed artificial means, or by combinations effected in the ordinary processes of smelting metallic ores. In the Museum of Natural History, at South Kensington, an interesting and instructive collection of certain crystalline minerals may be seen, having all the physical and chemical characteristics of the natural minerals. They are, however, merely furnace products. This collection includes artificially formed cassiterite, augite, diopside, orthoclase, mica, rhodonite, willemite, magnetite, hematite, zincite, wurtzite, and galena. The majority of this series of minerals has been formed by crystallization from a fluid mass of molten material, others again by sublimation, and subsequent condensation on cooled surfaces. Perhaps the most interesting of this group, and one which more particularly appeals to us Cornishmen, is a beautiful crystalline specimen of cassiterite, said to have been found in the hearth of an Austrian tin furnace. The color of the crystals is unlike the native variety, being of a dark violet color. They are large and well defined, having the same crystalline form as the native mineral, but the propensity to twinning, which is found so abundantly in the native mineral, is curiously absent in the artificial variety.

In a somewhat lengthened experience my attention has been frequently drawn to a number of interesting examples of the artificial formation of crystalline compounds, as products from the smelting of ores, and it has often occurred to me that their formation may have, in some measure, been effected by causes similar to those which exist deep down in nature's laboratory.

The occurrence of metallic tellurium, as a beautiful crystalline sublimate, the brilliant octahedra of magnetic oxide of iron which has separated out from a highly basic slag on cooling, the formation of definite crystalline alloys of gold and silver, and of gold, silver, and lead, combiuations of sulphur with copper and lead and iron, indicate that artificial minerals may be produced iu the ordinary operations of smelting, which possess the form and composition of their primitive kin.

By way of example, I may draw your attention to the formation of metallic gold in the hearth of a reverberatory furnace, on which copper ore, containing gold and silver, has been smelted. It will be necessary for me to describe briefly the conditions which exist in the smelting of ores by such methods as are generally adopted. The aim of the smelter is to produce what is called a 'matte,' which shall contain the copper, gold, and silver in a more concentrated form than they originally existed in the ore. Normal matte may be said to consist of copper and sulphur with varying quantities of iron, together with certain impurities such as lead, arsenic, antimony, and bismuth.

If we study what happens when a mass of molten material in the form of matte is almost in constant contact with the upper surface of the hearth of the furnace, we find that absorption of molten matte by the hearth takes place, rapidly at first, when the hearth is new, and slowly increases, until a condition approaching saturation is reached. We find too that a separation takes place of certain easily fusible compounds of sulphur with copper and lead, so that a series of definite compounds are produced, having varying degrees of fusibility and specific gravity, and differing in chemical composition and physical characters.

The most easily fusible of these compounds find their way down below the smelting zone, and into the cooler parts of the hearth, where they crystallize out and form, frequently, an interesting series of products, not unlike, in some cases, certain minerals that occur in nature. Crystalline alloys of gold and silver, and gold, silver, and lead, have been found in the joints of the brickwork that forms the support of the hearth. In the case of the crystalline alloy of gold and silver, which has a high melting point, and therefore could not have reached the cool parts of the hearth in that form, there is abundant evidence to show that the metals were originally associated with lead, which caused their low fusibility, and that a secondary action had taken place, by which the lead became oxidized into minium or red lead, the alloy of gold and silver crystallizing out in all its purity, with a brilliancy of lustre, and a perfection of crystalline form, equal to the metals and alloys found in nature.

Personal.

CURTIS H. LINDLEY is at Salt Lake.

R. M. ATWATER is in South America.

ARTHUR L. WALKER has gone to New York.

EUGENE B. BRADEN is at Portland this week.

W. A. MERCER has left London to go to Russia.

J. D. HUBBARD, of Chicago, was in San Francisco last week.

H. LEUPOLD has left Buenos Aires on a journey into the Andes.

F. P. CADDY has received an appointment in Eastern Siberia.

L. W. WICKES is manager of the Ely Witch mine at Ely, Nevada.

FRANKLIN R. CARPENTER, of Denver, has been at Ely, Nevada.

C. C. EASLEY is superintendent for the Parral Corporation, at Parral, Mexico.

R. A. VARDEN has returned to London after a year's absence in South America.

CHAS. M. MACNEILL and D. C. JACKLING spent a few days in San Francisco.

WALDEMAR LINDGREN has been elected president of the Geological Society of Washington.

W. H. BLACKBURN has been appointed superintendent for the Tonopah Mining Co., of Nevada.

F. G. T. NICHOLAS has left Western Australia to accept an important appointment at Melbourne.

FRANK A. MOSS, of Kalgoorlie, has been elected president of the Australasian Institute of Mining Engineers.

J. V. N. DORR is consulting metallurgist for the New Southern Cross Co., whose mines are at Cable, Montana.

STANLY A. EASTON, manager of the Bunker Hill & Sullivan mine, at Wardner, Idaho, is visiting San Francisco.

R. C. TURNER has resigned as superintendent of the Tonopah mine, but he will remain at Tonopah for the present.

W. ROWLAND COX is in charge of the Dolores mines, at Matehuala, Mexico, for the American Smelters Securities Company.

W. G. KING, formerly of the School of Mines, at Butte, is now with Bettles, Mathez & Co., assayers and chemists, at Salt Lake City.

H. A. SHIPMAN has resigned as general manager of the Nevada United Mines Co., and JAMES A. SNEDAKER has been chosen managing director.

A. C. LAWSON, professor of geology in the University of California, has been lecturing on the earthquake before scientific societies at Washington.

F. CUSHING MOORE has resigned as chief engineer of the Federal Mining & Smelting Co., to resume the practice of his profession at Wallace, Idaho.

R. H. HAWLEY, for a number of years superintendent of the U. S. Smelting Co.'s plant at Canyon City, Colo., is now with SAMUEL NEWHOUSE, Salt Lake City, Utah.

ROBERT LINTON, of R. M. Atwater & Co., accompanied by R. DE SALIER, has just completed an examination of mining properties in Coahuila and Nuevo Leon, Mexico.

H. C. SCHMIDT has resigned as superintendent for the Minas Dolores y Anexas to become superintendent of mines for the National Metallurgical Co. of Matehuala, in San Luis Potosi, Mexico.

CHARLES E. CHRISTENSEN, mechanical engineer, who has been with Fraser & Chalmers and their successors, the Allis-Chalmers Co., for 28 years, at Chicago, has moved his office to the West Allis Works at Milwaukee.

FRANK ROBBINS is examining placer ground on the Colorado river and later in April he will make his usual visit of inspection to the nitre lands in Inyo county, California, returning to Los Angeles about May 1.

Publications Received.

BIENNIAL REPORT of the State Geologist of Missouri, by E. R. Buckley.

DEPARTMENT OF MINES, TASMANIA. 'Report on Cox's Bight' by W. H. Twelvetrees, Government Geologist.

RECORDS of the London and West Country Chamber of Mines. Vol. II, Part XV. By the honorary secretary, J. H. Collins.

'The Manufacture and Properties of Iron and Steel' by Harry Huse Campbell. This is the fourth edition of a book now well established in the esteem of metallurgists. Published by the Hill Publishing Co., of New York.

U. S. DEPARTMENT OF AGRICULTURE, Farmer's Bulletin No. 277. 'The Use of Alcohol and Gasoline in Farm Engines,' by Charles E. Lucke and S. M. Woodward. A 40-page pamplet of interest alike to agriculturists and mining men.

U. S. GEOLOGICAL SURVEY.—1. 'Mineral Resources of the United States,' 1905. Edited by David T. Day. This is a useful volume, the value of which would be greater if it were not fully one year overdue. 2. 'The Yampa Coal Field,' by N. M. Fenneman and Hoyt S. Gale. Bulletin No. 297. This is an account of a new coal area in Routt county, Colorado. 3. 'Economic Geology of the Kittanning and Rural Valley Quadrangles, Pennsylvania.' Bulletin No. 279. By Charles Butts.

Books Received.

'Concrete Factories,' compiled by Robert W. Lesley. An illustrated review of the principles of construction of reinforced concrete buildings, including reports of the U. S. Geological Survey, and the French rules on reinforced concrete. Bruce & Banning, Publishers.

'Long-Distance Electric Power Transmission,' by Rollin W. Hutchinson, Jr. A 350-page treatise on the hydro-electric generation of energy; its transformation, transmission, and distribution. A well-arranged book, combining theory with practical suggestions, which should be of value to designers and operators alike. The D. Van Nostrand Co., New York. Price, $3 net.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco, April 10.

Argonaut	$4.80	Central Eureka	$0.75
Con. Virginia	1.10	Savage	0.98
Mexican	0.96	Sierra Nevada	0.66
Ophir	2.47	Yellow Jacket	1.03
Belmont	4.87	Midway	1.70
Combination Fraction	4.50	Montana	3.65
Goldfield Con	7.93	Mohawk	16.50
Jim Butler	1.10	Nevada Hills	3.80
Jumbo	4.00	Red Top	4.00
Jumping Jack	0.15	Sandstorm	0.67
Manhattan Con	0.80	Silver Pick	1.18
Manhattan Dexter	0.23	Tonopah Ex	4.05

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
April 5	24⅜	6	6¾	64⅞
" 6	24⅜	6	6¾	64⅞
" 7	Sunday.	No market.		
" 8	24¼	6	6¾	65¼
" 9	24¼	6	6¾	65¼
" 10	24¼	6	6¾	64⅞
" 11	24¼	6	6¾	65⅛

ANGLO-AMERICAN SHARES.
Cabled from London.

	April 4.	April 11.
	£ s. d.	£ s. d.
Camp Bird	1 4 3	1 4 6
El Oro	1 7 6	1 7 6
Esperanza	2 1 3	2 1 3
Dolores	1 12 6	1 11 3
Oroville Dredging	0 17 6	0 18 0 ex div.
Stratton's Independence	0 3 6	0 3 6
Tomboy	1 17 6	2 0 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

Mining Summary.

ALASKA.

NOME DISTRICT.

Reports state that the Lost Cabin placer mine has been found by prospector McLeod. It is on the Firth river, over the divide from Chandlar, running into the Arctic Ocean. Two men made the strike originally, took out $26,000 and started for the outside by way of the Arctic and Bering sea, but died before they could return.——It is reported that the Candle City district is doing well this winter, and it is expected that the clean-up will be $200,000 more than last year. The benches on Candle creek are showing up especially well. Coal is being mined regularly on the Inmachuk, and sells for $10 per ton since the heavy snowfall made freighting easy.——A quartz vein has been discovered on the upper part of Dry creek, in the Nome district. The lode was discovered by Lokke & Berg, while running a drift from the bottom of the 80-ft. shaft on their placer claim.

ARIZONA.

COCHISE COUNTY.

Deeds to 116 claims have been recorded, in the transference to the Superior & Pittsburg Copper Mining Co. of those claims included in the old Calumet & Pittsburg, Lake Superior & Pittsburg, Pittsburg & Duluth, and Junction mining companies. The Superior & Pittsburg company, known as the Cole combine, will operate all these properties, with L. W. Powell as superintendent.——On account of the rapid development in the Superior & Pittsburg, the Calumet & Arizona company is rushing the work on the new furnace for the smelter at Douglas, which will give the plant an additional capacity of 600 tons per day. The plant as now running has five furnaces, each with a capacity of 300 tons per day, and enough converters to handle the matte.——The Spray shaft of the Copper Queen company was closed about two months ago to give the timbermen a chance to straighten it. Shifting and sliding of the country had thrown it so much out of line that it could not be used below the 500-ft. level. This work has been completed, and the big hoist will be lined up with the collar, at once, and hoisting will start within a week. The closing of the shaft was a big handicap to the company, as it was a main artery and the biggest producer of ore in the district.——The new smelter to be built by the Shattuck-Arizona company will probably be situated at Douglas. Arthur Houle, who was connected with the Globe smelter, the Grand Encampment plant, and the Calumet & Arizona, will have charge of the design and erection of the plant. There will be two 400-ton furnaces, and a power-plant sufficient for double this capacity.——There is a shortage of men in Bisbee, but new recruits are constantly arriving, attracted by the high wage-scale. The companies continue to discharge men identified with the Labor Union, and the Western Federation of Miners is no longer considered a factor in the camp.

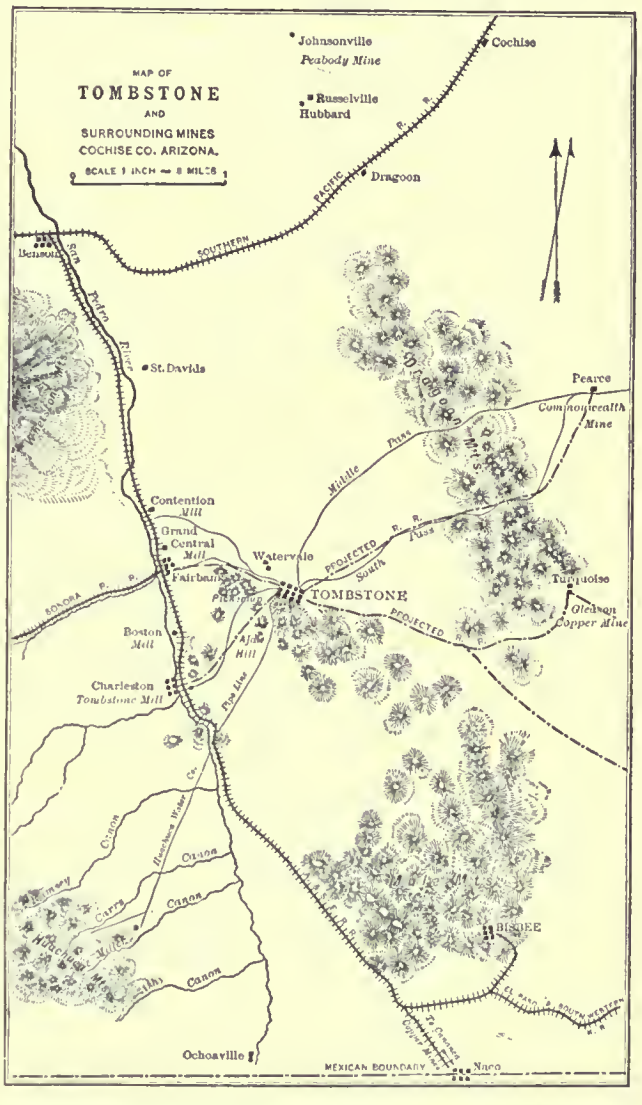
GILA COUNTY.

In the Old Dominion property, at the 70-ft. point in the second cross-cut on the 14th level, the entire vein will run 10% copper, and the vein is richest at the bottom. At No. 3 cross-cut, 100 ft. further along, they are in but a short distance, but the vein shows up here even better. Drifts connecting the cross-cuts are being run and will soon be completed, which will do much to improve the ventilation. The next move in the development will be to sink a winze to the 1,600 level, cross-cut to the vein, and then raise for a shaft.——At the smelter four furnaces are in commission, though one is not in the best of condition, and will probably have to be blown out for repairs. A fifth furnace, however, should be ready by June 1, and the management is considering the advisability of building a sixth.——No definite action has yet been taken regarding dividends, but it is officially stated that a substantial amount will be disbursed before the year is out.

GRAHAM COUNTY.

The New York-Arizona company, operating near Clifton, has let the contract for a 100-ft. shaft, to be sunk on the Louise claim. A gasoline hoist will be installed.——Several shareholders have recently visited the Cuprite property. Development has been going on for several years.——The Chase Creek property, near Metcalf, is being developed by a long tunnel. The workings have now attained a depth of 800 ft., and some ore has been encountered.

The Mitchell smelter, which was erected at Globe to handle the output of the Five Points property, has not been blown in yet, as it was found necessary to make some changes. It may be found advisable to delay this until the railroad is completed, which will be in about two months. ——The Gem shaft of the Globe Consolidated Copper Co. is down 575 ft. and cross-cutting is proceeding on the 500-ft. level. The shaft will be continued to the 1,100-ft. point, and the principal work will be on the 1,000-ft. level. At the Gray shaft, the drift on the 500 level cut the Lizzie vein, and a



drift is being driven on the 700 level, under Buffalo hill. The Globe shaft is down 480 ft., and sinking will be continued to the 800-ft. point.

PIMA COUNTY.

Pima county mines are shipping about 15,000 tons of ore per month, most of the ore going to Douglas for treatment ——The Mineral Hill company has 30 teams hauling ore A good body of ore has been developed on the 200-ft. level About 80 miners are employed, and E. B. Reeser is the manager.——The San Xavier mine is reported to have been sold. There is 5,000 ft. of development work, and 55,000 tons of ore have been shipped from the property.——The Calumet & Arizona company is working three diamond-drills on No. 99 claim, and about 10 holes will be put down 800 ft. on this property. Another drill is working on the Tom Hughes claim of the same company.——A good strike has been made in the Daisy mine of the Cleveland-Arizona company in the Silver Bell district. In cross-cutting the concentrating ore on the 100-ft. level, a large body of high-grade ore was encountered. The shaft will be unwatered and work will be resumed on the old 200-ft. level.

PINAL COUNTY.

(Special Correspondence).—The Saddle Mountain Mining Co. is enlarging its mining and smelting plants and the camp of Christmas is showing a rapid growth, having a population of about 1,000. The company is constructing a narrow-gauge railroad along the Gila river from the end of the grade of the Southern Pacific railroad to the hill leading up to the camp; and from the smelter to the camp a tram is being installed, the total distance covered by the railway and tram being three miles. About 100 men are engaged in the work. The production at the smelter of the company from March 1 to March 18 was 310,000 lb. of matte carrying 54% copper, produced with a blast-furnace of 200 tons capacity. The company has purchased and is preparing to install an additional furnace giving a combined capacity, when completed, of about 600 tons per day. The new three-compartment working shaft is down 140 ft., and it is expected that this shaft will have reached the 400-ft. level by the time the new smelting plant is finished. New hoists and boilers have been installed at the No. 1 and Hackberry shafts, and sinking has been resumed. George B. Chittenden is the general manager for the Saddle Mountain Co., and James W. Meyers is the smelter superintendent.

Phœnix, April 8.

Two new organizations, known as the Ray Copper Co. and the Gila Copper Co., have been formed to work the Ray claims on Mineral creek, above Kelvin, and the Kavanaugh group, adjoining this ground on the west and north. These organizations were effected largely through the efforts of Charles H. Cutting, who used to be with the Troy-Manhattan company.

CALIFORNIA.

AMADOR COUNTY.

A force of men is working in the shaft of the Burlington mine.——Nothing new has developed in the transfer of the Wildman mine and nothing is being done, except that the water is being kept out of the Mahoney, pending the settlement of the financial difficulties which seem to surround these properties.——Oil for fuel has been exhausted at the South Eureka, and all the men have been laid off, with the exception of the engineers and shaft men.——The air-compressor for the Keystone mine at Amador City has been installed, and operations in the mine have commenced again.

INYO COUNTY.

All the supplies for the 300-h.p. electric plant of the Casa Diablo Mining Co. have been shipped from Chicago and five miles of the eight-mile pipe-line have been finished. As soon as the water and electric plants are finished, fifty miners will be employed. A 30-stamp mill will be erected, as the vein has widened to six feet, and 3,000 tons of high-grade ore are on the dump and enough more in sight to justify this increase over the 10-stamp mill originally designed for the property. C. A. Frohman is the general manager and Charles Meier is the consulting engineer.——The Killian Mining Co. will get electric power from the Casa Diablo plant, and expects to soon start development work. L. B. Killian is the superintendent.——A good strike is reported in the Black Canyon property near Bishop. The ore is free milling and assays as high as $300 have been returned.

MONO COUNTY.

The Mono M. & M Co. has made the second payment to J. W. and Clarence Brown, on the Sacramento mine. The Cowser tunnel cut a 10-ft. vein at the 156-ft. point.

NEVADA COUNTY.

Some trouble is still experienced in Grass Valley, from the uncertainty of the electric power. The North Star company had to lay off the men for some days, owing to the temporary lack of operating power, and the bad air in the workings. The pumps are running to their full capacity. ——At the Empire, a full force is at work, and the mill and pumps are running, although temporary interruptions occur.——The Sultana shaft has not yet been unwatered to the 600-ft. level, and no mining operations are carried on.—— Development continues on the copper property at Iron Mtn., of which William Tarpie is the superintendent.—— The Gold Mound company of Spokane, which is operating at Deadman's Flat, has installed a new gasoline hoist and pump and is preparing for a busy summer.

PLACER COUNTY.

Some work is being done in the old quartz mine at Bird's Valley, near Michigan Bluff. This property was a producer 40 years ago.——Work will soon begin on the American, or old Alabama vein.——Work on the Imperial ditch has been suspended on account of the heavy snowfall.—— The width of the channel at the Home Ticket mine has not yet been determined, although it is known that the pay-gravel ranges from five to seven feet deep, and the channel has been worked 200 ft. wide.——A tunnel has been started to explore the Three Queens property, in Volcano cañon.—— The Hathaway, Butts, Kirkland, and Eureka mines of the Ophir Valley Mining Co., a corporation of New York men, lie on the north side of the ridge between Ophir and Newcastle. A tunnel 260 ft. long has been driven and a shaft 815 ft. deep has been sunk on the Hathaway, but this property was never worked below the 600-ft. level because power for pumping and hoisting was insufficient. The new company is installing new electric machinery, including a 75-h.p. motor for the Sullivan air-compressor, a 40-h.p. motor for the 10-stamp mill, and two smaller motors for the pumps and the coarse crusher. Power will be bought from the Bay Counties Power Co. A. B. Eastwood is the superintendent.

SIERRA COUNTY.

(Special Correspondence).— At Brandy City extensive development work will be done this summer, re-opening an old hydraulic mine that was closed down during the anti-debris agitation. The present owners have a permit to build a tailing-dam in Cherokee creek. There are several miles of flume to build to bring a supply of water to the ground, and a long bedrock tunnel must be run in order to run the tailing into Cherokee creek, instead of Canyon creek, where it was formerly dumped. A wagon-road will be built from Camptonville to Brandy City, and two sawmills will be installed to cut the lumber for the flume. J. R. Meek is superintendent.—— Gravel mining at Forest City is active. The South Fork is driving the main gangway, and expects to strike the Extension channel soon. At the Young America they are taking out pay gravel. At Alleghany both quartz and gravel-mining are active.—— H. L. Johnson has let a contract for the lower tunnel that is to tap the Tightner, to Gabe Nelson and others.—— The Oriental has closed temporarily on account of a break in the power line.—— The Plumbago is running with the usual force of men; they were hindered from running for a short time by the high water flooding the power house.—— The unprecedented storms of this winter have caused a great loss of property in the district. A snowslide carried away the bunk-house at the Sovereign mine and operations were suspended. At the Telegraph, on March 23, a snowslide carried away the mill, but missed the bunk-house about 50 ft. This is a severe loss, as some rich ore has been blocked out this winter. At the Keystone mine a large slide carried away the mill and a number of other buildings. The upper tunnels at the Buttes caved, and a large break in the ditch has caused the mill to hang up until the ditch is repaired. —— Notwithstanding the severe winter and continuous storms, there has been some new work done. John Costa has been driving a tunnel from the White Bear ground to tap the Excelsior channel, and has been in hard rock. The ground now is softer, and he expects to reach the Excelsior ground about July 1.——The West Point company has been running the main gangway in good gravel, and will soon begin breasting.—— At the Papoose mine, in Jim Crow cañon, a 10-stamp mill is being built that will be ready to run in about three weeks. George McGee is superintendent. —— At the Antler mine they are preparing to start a lower adit to the vein at great depth.—— In the American Hill district, several gravel companies are preparing to run long tunnels to tap the gravel channel that is known to exist there.—— The Sovereign company intends to begin extensive work, building a road to the mine from Sierra City, a sawmill, and stamp-mill.—— The Primrose has a lot of machinery in Sierra City to be moved to the mine as soon as the roads are passable.—— The Herkimer company

intends making extensive surface improvements.——The Poker Flat company will start work as soon as materials and supplies can be transported to the mine.——J. B. Kendell, of Tonopah, has an option on the Soda Spring mine on Canyon creek, and will soon start development work.——Sarat C. Rudra expects to start work in the Gold Point mine and cyanide plant soon.——Morse Bros., and McGee & Farrell have bought J. J. B. Corney's interest in the Comet mine. With the other owners, Geo. F. Taylor and Henry Spaulding, Jr., they will soon begin active development. The writer has visited this property a number of times, and it is one of the largest quartz lodes in northern California, and carries about $4 per ton. Heretofore it has been treated as a free-gold proposition; more than half the values are in the sulphides, which have been found to yield readily to the cyanide treatment. The present owners intend installing a larger mill and cyanide plant to treat the tailing.

Downieville, April 8.

TUOLUMNE COUNTY.

(Special Correspondence).—A report comes from the Jawbone district, east Tuolumne, which briefly tells of a rich strike having been made in the Lumsden mine. A cross-

California.—Showing Position of the Counties.

cut shows a 12-ft. vein, which assays as high as $200 per ton.——The mill at the Soulsby mine is to be started shortly.——The crew of 10 miners at the Santa Ysabel mine, near Jamestown, is soon to be increased. It is the intention to sink the shaft to 1,600 ft. Its present depth is 600 ft.——The Josephine mine, near Stent, has been bonded to H. M. Shaw. The price to be paid for the property is $12,000.——The Belleview mine, situated north of Soulsbyville, at which nothing has been done for many years, is to be reopened soon by a new company, the name of which has not yet been made know.——On April 1 the Bagdad-Chase G. M. Co. voluntarily increased the pay of all of its employees working underground. The working hours were at the same time reduced, the maximum shift now being nine hours, and the minimum eight. Under the present wage-schedule, machine men receive $3.50 per day, chuck tenders, $3.25, and muckers, $3. Besides this, the company has given to each of its 75 employees an insurance policy containing both death and accident clauses.

Tuolumne, April 8.

COLORADO.

GUNNISON COUNTY.

The Poverty Gulch district is situated seven miles northwest of Crested Butte and five miles from the Irvine mines. The first operations there started in 1880, on the Augusta and Excelsior properties, at an altitude of 12,000 ft., and a 2,500-ft. tramway was operated. A new company is now working these mines, and it is expected that they will again become producers.——Four long cross-cut tunnels are being run at Ohio Creek, a 100-ton mill is operating, and a 40-stamp mill is being built. The Carter tunnel of the Ashland company is in 2,700 ft. The 100-ton mill is at the Raymond property, and has been in operation over a year. E. M. Lamont is the manager.——The new mill is being built on the Gold Link, owned by the Colorado S. & R. Co. The tunnel at the property has been driven 2,600 ft. J. F. Pearsons is the manager.

SAN JUAN COUNTY.

The Anti-Periodic group, on Galena Mtn., has been sold to the Galena Mountain G. & S. M. Co. This property has been developed by 1,000 ft. of tunnels and raises, and small shipments have been maintained for some time.——Development work continues on the John Price group, south of Kendall Mtn., which has been leased and bonded by E. W. Ferguson. The tunnel on the Gold King vein is 575 ft. long, and follows a narrow lode all the way. A 50-ft. shaft connects with this tunnel.——The towers for the Aspen tram are completed and the cables are being stretched This line, which is independent of the Silver Lake tram, is three-quarters of a mile long, and will be operated by electric power.——Electric motors will be installed at the mine and mill of the Hamlet company. The mill-tunnel is in 700 ft., and will proceed at the rate of 200 ft. per month. When the tunnel is completed, a raise will connect it with the upper workings, and all the ore will be taken out at the mill level.——The Green Mtn. mill will be started April 1, if the repairs are finished. The plant has been thoroughly overhauled and it is expected that a better saving will be made under the new system. The company owns an 18-in. pipe-line, 4,000 ft. long, with a vertical fall of 230 ft., which will furnish power for mine and mill.——Some good ore is being taken out of the Ruby Basin mine, near Burro bridge, up Mineral creek. The mine has been worked all winter by contractors, operating principally on the Tornado vein.——Good progress is being made on the Wonderful group, belonging to the Precious Metals Co., situated in Mill gulch above Chattanooga. The vein was cut by a cross-cut tunnel, after running 300 ft. and gaining a depth of 150 ft. Driving is now in progress, on the vein.——The Henrietta property of the San Juan S. & R. Co. is being worked by lessees, and ore is shipped to the smelter that averages $28 per ton. The Colorado Iron Works is building machinery for a mill, for this company.——The Highland Mary mine, belonging to the Gold Tunnel & Railway Co., at the head of Cunningham gulch, has been closed on account of a disagreement among the stockholders.——The Gold King mill is turning out about 75 tons of concentrate per day.——The Gold Prince mill is running steadily, and by April 1 the mine will be working at its full capacity and the 100 stamps will be handling about 500 tons of ore per day.——The Detroit & Colorado M. Co., shipped 13 cars of ore to the Ross smelter during February.——The Yukon tunnel, of Boulder Mtn., trending from Cement creek to the Uncle Sam, is now in 2,550 ft. Several veins have been encountered.

IDAHO.

SHOSHONE COUNTY.

The Bunker Hill & Sullivan has paid its 114th dividend, which was $180,000, making a total of $8,406,000 to date.——Drifts are being run east and west on the vein of the Independent mine, and some concentrating ore has been disclosed. The vein is holding well in size.——Development work is being pushed on the Star group of 17 claims, which adjoins the morning mine on the west and is controlled by Finch & Campbell, of Spokane. E. H. Mollitt is the manager. The group includes three veins, the first of which was cut by the new tunnel, which is in 1,100 ft. The mine is equipped with a six-drill compressor and owns a power-line three miles long, from the Morning compressor to the mine.——The Hecla mine at Burke continues its steady production. The shaft is 900 ft. deep, and three levels have been driven from it. The 900-ft. level has been driven for

1,000 ft. in the ore-shoot, and is proving to be in the richest horizon yet encountered. The new sorting and conveying-belt recently put in operation at the head-frame is working nicely and results in a better grade of concentrating ore being shipped to the mill. The company will install a new electric hoist with a capacity of 2,500 ft., and will then sink below the 900-ft. level. J. R. Smith is the president of the company, and James F. McCarthy is the manager.——A new shoot of high-grade ore has been encountered in the Hennessy-Burns group of four claims. The ore was found when the tunnel was in 120 ft., the 10-in. pay-streak coming in from the hanging-wall side. This property is situated seven miles east of Burke, on the Idaho-Montana summit. ——Good concentrating ore has been cut in the Sailor tunnel, on Slate creek, about 14 miles south of Wallace. The vein is 14 ft. wide and has been test-pitted for 800 ft. The group contains six claims and the owners are principally Wallace people.——Two properties on Terror gulch are working steadily. On the Golden Queen group the cross-cut is in 380 ft. and has 140 ft. to go, to cut the vein. The Terror Con. Co. is driving a tunnel on its vein.——Along with the regular monthly dividend of $20,000, the Success management is sending out the announcement of the strike of an entirely new ore-shoot, which was found by extending a drift on the No. 3 level, above the lower tunnel. The new orebody is nearer the granite hanging wall than any shoot previously opened. The Success now employs 75 men, and is turning out 1,000 tons of zinc and lead concentrates per month. This mine was originally known as the Granite, and 14 years ago was one of the camp's big producers, but was closed down and abandoned after about $1,000,000 had been paid in dividends.——The Pittsburg company's mill started March 1, and has since been running steadily.—— The Snowstorm company has declared another dividend of $45,000, in spite of the fact that the mine only ran 16 days in February, on account of the blockade of the Northern Pacific railroad.

MONTANA.

FERGUS COUNTY.

The most important development in a mining way witnessed in Lewiston in some time was the recent sale of large blocks of stock in the North Moccasin mine to a party believed to be acting for the Kendall company. The sales were made on the basis of a $500,000 valuation for the Drake property, each shareholder getting a chance to sell his stock at $1 per share. The deal can only mean that the North Moccasin is to be taken over by one of the big companies. The prevailing impression is that the Barnes-King company will ultimately take over the Kendall and Moccasin, as all these properties are now being examined and sampled.

MADISON COUNTY.

The Unity Gold M. Co. has been formed in Omaha to work the Kearsarge mine, near Virginia City. Ten men are already at work, and the shaft will be sunk 700 ft. This property produced a large amount of gold about 40 years ago, from surface workings, but there is not a deep shaft on the property, or anywhere in Madison county, and therefore operations on this property will be watched with interest. ——A rich strike is reported in the Bedford mine of the Ramshorn mining district. A 28-in. vein was uncovered in a winze below the tunnel, and 10 in. is galena, with some copper. The property is owned by Francis Redfern, and three carloads of the ore are ready to be shipped to the East Helena smelter.

MISSOULA COUNTY.

Reports received in Spokane are that T. L. Greenough and associates have gained control of the stock of the old Iron Mountain Mining Co. The property lies east of the Cœur d'Alenes, five miles north of De Borgia, and was at one time a great producer of silver and lead, but it has not been worked for eight years. The workings consist of one shaft which was sunk to a depth of 1,800 ft. Work was suspended when a law was passed by the Montana legislature to the effect that every mine must have at least two exits. The orebody is 350 ft. long, and the ore having been taken out to so great a depth as 1,800 ft., the owners were in doubt if enough ore could be mined to pay for driving the long tunnel which would tap the ore-shoot at a great depth. Work was started last spring on a cross-cut tunnel which will be driven nearly two miles. Eight power-drills are being used, and the tunnel is being advanced at the rate of 50 ft. per week. It will require three years more to finish the big bore.

OREGON.

CURRY COUNTY.

(Special Correspondence).—A vein is reported on the property of the Chetko company, of which A. E. Imbler is the superintendent. A cross-cut has been run 50 ft., into some good peacock-copper ore. This property is in Curry county, within 18 miles of the Coast.

Ashland, April 8.

JACKSON COUNTY.

(Special Correspondence).—The Ashland antimony property, which was discovered last summer 11 miles south of Ashland, and on the southern slope of Ashland peak, has been leased and bonded to the Chapman Smelting Co. of Oakland, which makes a specialty of treating base ores. This property contains stibnite ore, running 60% antimony. Operations will be commenced on this property at once, and the ore will be shipped to Oakland for treatment.

Ashland, April 8.

WASHINGTON.

OKANOGAN COUNTY.

The Copper World M. Co. will install a hoist as soon as the snow is off Palmer Mtn. The vein is 25 ft. wide at the bottom of the shaft and is reported to be shipping ore, principally iron sulphide.——In the cross-cut on the 300-ft. level of the Copper World Extension mine 30 ft. of soft mineralized material has been intersected. The hanging wall has not been reached.——A body of ore rich in ruby silver has been uncovered in the Horn Silver mine, and some of it will be shipped as soon as the roads are clear of snow.——A blind vein of copper ore, three feet wide, has been encountered in an adit on the Palmer Lake group.——The Little Chopaca mine, on Little Chopaca Mtn., is being reopened, and good indications are reported.——A fine body of silver-lead ore has been opened in the lower adit of the Favorite mine.—— The Ruby mine, at the base of Mt. Chopaca, on the Similkameen river, which has paid expenses from the grass roots, is now in a position to ship a considerable tonnage of both high and low-grade ore. Railway transportation over the Victoria, Vancouver & Eastern railway will probably be available in a few weeks, as the rails are being laid between Oroville, the present terminal, and Nighthawk, about three miles distant from the Ruby mine. The roadbed passes the Ruby within a stone's throw of the lower adit.——At the Phil Sheridan mine, about 14 miles northwest of Republic, a winze has been sunk below the upper adit level, a shaft is down 106 ft. and drifts have been driven 251 ft. on the adit level. All of those openings are on a vein, three to five feet wide, and the average value of the ore extracted is said to be $63 per ton, most of which is silver. The winze gives a total depth of 141 ft. on the vein.

Republic, March 30.

BRITISH COLUMBIA.

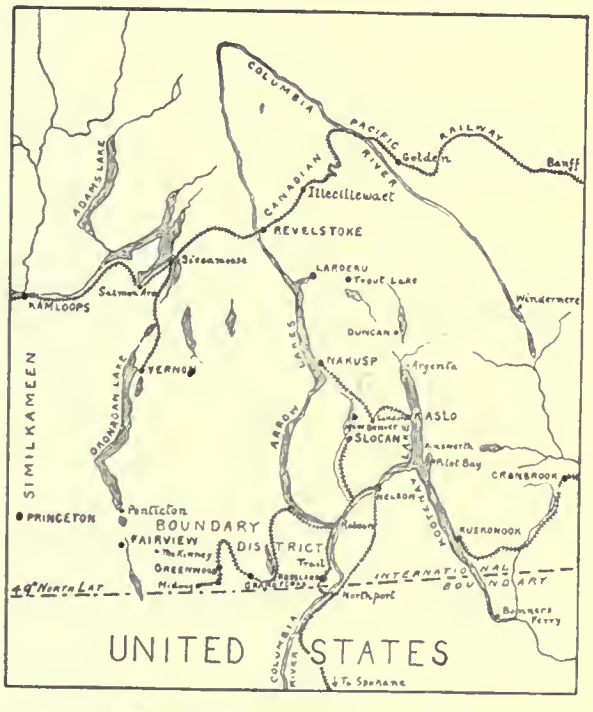
The shipments from the Rossland mines for the week ending March 30 were as follows: Centre Star, 2,320 tons of ore; Le Roi, 2,555; Le Roi No. 2, 525; White Bear, 80. Total for the week, 5,480 tons.——The installation of the new hoist at the Centre Star is making good progress. The electric locomotive that was installed this week on the 350-ft. level, and which is used in hauling ore and waste from the War Eagle to the Centre Star shaft, is working satisfactorily. The shaft is now 50 ft. below the fourteenth level and will soon reach the fifteenth level. Surface work on the Idaho continues, and also work by drifts extended in from the fourth and twelfth levels of the Centre Star.—— At Le Roi there is a good chance for an increased production. The shaft has reached the 1,650-ft. level, and will be extended by contract work. The pipe-line being laid from the Black Bear compressor to Le Roi will soon be completed. A small hoist is being erected on the Spitzee, but will soon be supplanted by a larger one.——It is reported that M. R. Galusha, manager of the Jumbo mine, has raised

sufficient funds to continue work on this property, which has shipped several thousand tons of ore in the past.

At the smelter of the Consolidated company, at Trail, there were received during the past week 5,663 tons of ore. In addition to the ore that came from Rossland mines, the following sent ore to this smelter: St. Eugene, Moyie, 425 tons; Snowshoe, Phœnix, 115; Eureka, 27; Aberdeen, 12; Arlington, near Erie, 22; Midnight, 8; Myrtle, 23.——Two furnaces are running at Northport, and coke is coming in good quantities.

The following were the shipments from the Boundary mines for the week ending March 30: To B. C. Copper Co.'s smelter from the Mother Lode, 4,200 tons; from B. C. mine, 180; from Emma, 140; from Snowshoe, 950. To the Dominion Copper Co.'s smelter from the Brooklyn mine, 2,016 tons; from Rawhide, 1,856; from Sunset, 640; from Mountain Rose, 72. To Trail smelter from the Snowshoe, 700 tons; from Riverside mine, 30. To Nelson smelter from the Emma, 30 tons of ore. The total shipments for the week were 27,244 tons of ore, and the total for the year to date, 221,747.

The total smelter receipts in southeastern British Columbia for the week ending March 30 were as follows: Grand



Map of Part of British Columbia.

Forks, 16,390 tons of ore; Greenwood, 5,470; Boundary Falls, 4,584; Nelson, 319; Trail, 5,483; Northport, 1,056; Marysville, 600.

Latest advices from Spokane seem to indicate that the consolidation of the Giant and California companies is progressing, and that the shareholders are unanimously in favor of the merger. W. Y. Williams will probably have charge of the property. The development on the California consists of a 300-ft. tunnel and a 50-ft. shaft, and a 10-drill compressor is on the ground. The Giant has shipped some ore, carrying a high percentage of molybdenum.——The fuel and car shortage which has seriously affected the production of the Granby works for the past few weeks has been overcome and the plant is now treating about 3,000 tons of ore per day, one record run of last week having been of 2,940 tons in 24 hours. Eight furnaces will probably be running in a few weeks. If the labor difficulties with the Crow's Nest coal miners is amicably settled, the fuel question will probably not bother this district any more.—— Development is to be resumed at the Prince Henry mine this month.——Work will be started on the Last Chance property, adjoining the Bug Copper property in West Copper camp.——Electric machinery will be installed at the Crescent mine, two miles below Phœnix.——The big crusher at the Mother Lode property of the British Columbia Copper Co. is now being driven by electricity instead of steam, as was the original arrangement.——A new boiler and hoist are being installed at the Moreen mine, in Deadwood, and the mine will be operating in two more weeks.——For the past few days there has been but one furnace running at the smelter of the British Columbia Copper Co., owing to the difficulty in securing sulphide ore from the Napoleon mine while the roads are in such bad shape.——The Cariboo mine, at camp McKinney, is to be unwatered and sampled. The ore carries good zinc values.——Good ore is being stoped at the Bay mine, a mile from Greenwood, but no shipments are made on account of the bad roads.

MEXICO.

The Cabrera and American properties have been consolidated under the name of the Virginia & Mexico M. & S. corporation, of which Jesse Scobey is the manager. A reduction plant of 150 tons daily capacity will be erected.

CHIHUAHUA.

The Veta Colorado M. & S. Co. will equip its property with a 250-ton mill. New York men control this property, which is situated at Minas Nuevas, seven miles from Parral, and is adjoined by the Veta Grande and Los Muertos. The Quebradillas mine, which forms the nucleus of the company's property, was opened less than 10 years ago, but is now developed by three shafts. The Veta Colorado vein is being worked from the Santiago inclined shaft, which is 1,000 ft. deep, with levels at each 100 ft. The electric pumps, when installed in the shaft, will have a capacity of 1,000 gal. per minute. The company has just completed a new power-plant for generating electricity that will be used at the mine and mill. While the present capacity of the Santiago shaft is only about 100 tons per day, the new central shaft, as soon as it is connected with the workings, will be able to handle 750 tons per day. At the 300-ft. level, which is the highest from which ore is being hoisted, the pay-ore is about 75 ft. wide. About 10,000 ft. of development work has been done, and the company has been shipping 2,500 tons of ore per month to the Mapimi and Torreon smelters, netting $13 per ton from Mapimi and $11 from Torreon. John W. Conner is the manager, and about 400 men are employed.—— The Cia. Minera Ramon Corona de Naica, of the Naica district, began shipping ore to the Torreon smelter last week, and will be a steady shipper henceforth. George Stinson is the manager.—— It is stated that a smelter is to be built by the Mexican Gold Copper Co. at the mines of that corporation in the Guaynopa district. C. H. Hadley is the superintendent.—— W. B. Brooks is erecting a concentrating plant to work the sand of Ocampo creek. It will have a capacity of 40 tons per day.

The Oxnam Prospecting Co., an English corporation, subsidiary to the Palmarejo & Mexican Gold Fields, Ltd., of London, has started its 75-ton reduction plant This company is operating the Guerra al Tirano mine, about 25 miles from the Palmarejo property, in the Chinipas district. Sufficient ore is blocked out to run the mill for three years, above the 400-ft. level. Development work has been suspended, pending the arrival of pumps. An extraction of 88% is obtained in the mill by dry crushing and pan-amalgamation. W. A. Pomeroy is the manager.—— A 25-ton water-jacket furnace is being erected at the property of the Mexican Mines Syndicate, at Urachic, in the Rayon district of the western part of the State.——The new mill of El Rayo M. & D. Co., of Parral, has started. Bert Peterson is the manager.—— The Illinois Zinc Co., through its manager, T. F. Noon, has taken an option on Jose Lago's Las Plomosos zinc mines, about three miles from Picachos, near the Conchos river. The property consists of 190 *pertenencias*, and the ore is zinc sulphide, carrying some lead. A diamond-drill will be used in prospecting the ground.

JALISCO.

The Copper Range Mining Co., of Chicago, owning copper properties in the Autlan district of the State, has purchased a 50-ton copper smelting furnace. The property is in the municipality of Purificacion, and a good deal of development work has been done.

Special Correspondence.

Joplin, Missouri.

Big Output of Lead and Zinc Ore.— Successful Drilling Operations.— A New Mill.— Handsome Dividends.—Ore Under Webb City.— General Activity.

The week ending March 16, 1907, marks the biggest value for zinc-lead shipments ever recorded in the Missouri-Kansas district for one week. The total value for both minerals makes the handsome sum of $435,846, over $40,000 greater than any other one week, and the week ending March 23 was not far behind it. The highest price paid for zinc ore both weeks was $53.50. The highest price paid for lead ore was $85 per ton. The car situation is easing up, the railroads supplying a large number of coal-cars at the present time.

Shipments.	Zinc ore. Lb.	Lead ore. Lb.	Combined value.
Week ending March 16	14,366,760	2,018,470	$ 435,846
" " " 23	12,289,710	2,983,750	418,370
Up to date	143,267,140	21,584,600	4,288,370
Same period last year	120,024,880	16,673,640	3,291,555
Increase	23,242,260	4,846,960	996,815

The Alpha Mining Co., operating at Spring City, south of Joplin, has been a steady producer of 50 to 60 tons of zinc ore and 10 to 12 tons of lead ore for the past several months. The property is owned by Judge Pfost and

Sketch Map Showing Position of Joplin.

others, of Kansas City, and is a splendid paying proposition. The vein on which they are working lies in a draw, but keeps its flat dip into the side hills. They are working on the 100-ft. level, carrying a seven-foot drift, five feet of which is a sheet formation of pronounced richness. The character of this ore deposit is likened to troughs between ribs of flint, the lode being a conglomerate of lime, zinc ore, and lead ore. Burt Lyon, who has been drilling on the south 10 acres of the Rob Roy Mining Co.'s land, has gone through an 80-ft. layer of limestone into a bed of silicate, which the drill shows to be 40 ft. thick. This is a new occurrence in this district, as zinc ore is always encountered below the lime, if any mineral at all is found.

The Continental Zinc Co., one of the biggest companies in the district, owning a large acreage of land in Joplin, and also in the Webb City-Carterville district, is building a 300-ton mill on their land at Webb City, and is planning an innovation, the hoisting machinery having self-dumping skips instead of the regulation tub or can and cable. With this improvement it will be possible to hoist 1,000 tons of dirt, whereas 300 tons per shift has been a good record under the old way.—— The Morning Hour mine on the Marion B. Mining Co.'s lease of the Henderson land west of Joplin will, at the declaration of its next dividend, return to its stockholders the full sum invested, and future dividends will be velvet. Three dividends of 25 cents each have already been declared. This mine has been the wonder of the new field southwest of Joplin. From the present outlook at the property the company will realize many more dividends.

Col. James O'Neill, of Webb City, who purchased the fee of four acres in the south edge of Webb City from the estate of the late General John W. Noble, of St. Louis, reports that the sheet ground, or blanket vein, is being proved to exist over this tract, being encountered at the 180-ft. level. This establishes the existence of the blanket vein of zinc on the south of that city, as well as the north and east, and property owners are wondering if it is not possible that the entire city is underlaid with a rich lode. Seventy-five feet of ore is the report of the drill cuttings on the Jesse Trent land, three miles south of Granby. This new location of a deep ore deposit at a distance from any tested ground renews the interest in an extensive occurrence of rich zinc-lead ore around the mother camp of the Missouri-Kansas district. Mr. Trent owns 560 acres of land, and this is the first deep drill-hole put down, but it is his intention to keep a drill operating to determine the extent of the orebody.

Toronto, Canada.

Shipments From Cobalt.—Rush of Prospectors to New Districts.— Important Discoveries.— Difficulties of Access.—Larder Lake.— News From Cobalt.

At Cobalt, shipments of ore for the week ending March 30 amounted to 238 tons, the following being the shipping mines: Coniagas, 32 tons; Nipissing, 58; O'Brien, 72; Trethewey, 50; Townsite, 21; Right-of-Way, 2 tons. The Right-of-Way shipment was consigned to the Anglo-French Nickel Co. at Swansea, Wales.

The spring rush of prospectors is mainly in the direction of the new camps at Elk lake and Lady Evelyn lake, and other points on or near the Montreal river. The value of the deposits is now fully established. Willet G. Miller, the Provincial geologist, returned this week from a trip of inspection from the new district, and confirms the statements of valuable discoveries. The southern portion of the new field lies about 25 miles west of Cobalt, and about six miles north of Lady Evelyn lake, in the Temagami Forest reserve, the formation extending northward to Elk lake, an expansion of the Montreal river. Prof. Miller encountered great difficulties, having to drive 45 miles over ice, which was rapidly breaking up and covered with water, but succeeded in examining some of the finds. He reports that the geological conditions are similar to those of Cobalt, the deposits carrying cobalt bloom and smaltite, together with native silver and other minerals. Though no finds have yet been made showing a richness comparable to those at Cobalt, yet the similarity of geological conditions, and the substantial character of the veins uncovered, indicate that the district is one of great possibilities. So far the deposits north of Lady Evelyn lake have been found to occur in the diabase. At this point much development work has been done. On Elk lake almost the entire township of James has been staked and many locations made to the west in the Temagami reserve, as well as farther up the river. Notwithstanding the dangerous condition of the ice, many prospectors are going by sleigh up the river.

Liverymen at Latchford charge $10 per day for teams, and require a deposit covering the value of the horses as a security. As soon as navigation opens the Elk lake area will be accessible by steamer, as there are navigable stretches of water on which boats will ply, though transfers will have to be made at a couple of portages, and

there is also a water route from the river, west to Lady Evelyn lake. The T. & N. O. railway is building a branch to Charlton, 18 miles from Elk lake, which may be pushed through to that camp if the development justifies it.

The Larder Lake district is now being surveyed and laid out into townships. The Larder Lake Proprietary Mines Co. is undertaking development on an extensive scale. They have 26 teams at work taking in plant and material, including a stamp-mill and ten tons of dynamite, and are putting up camp buildings to accommodate 100 men. The Barnard's Point Gold Mining Co. has shipped to its claim a plant comprising a Rand compressor, a 25-h.p. boiler, hoist, etc. John Macdonald, late of the Silver Queen, Cobalt, has been engaged as superintendent.

The Beaver mine, at Cobalt, has changed hands, and has been taken over by a new company known as the Beaver Consolidated, of which F. L. Culver is president. Development is being pushed. Three shafts are being sunk, two of them being 45 and 50 ft. deep respectively. William Shovell, formerly superintendent of the Big Master gold mine in the Manitou Lake district, has been appointed superintendent of the Columbus Cobalt. The Rochester Cobalt has installed a new steam-plant, and the main shaft is down 45 ft. Some fine specimens of native silver have been taken out. Further work on the vein struck on the Peterson lake property, supposed to be the bonanza Nipissing vein, has been prevented owing to flooding. The draining of the lake to a lower level will be undertaken when the spring freshets have subsided.—— The litigation over the Lawson mine, one of the most valuable of the Cobalt properties, which has prevented development, has at length been terminated by consent of the parties. The settlement is practically an agreement to accept the judgment first given in the case.

Salt Lake, Utah.

Revival at Pioche.—The New Railroad.—Silver King Consolidation.—The Cactus.—Ohio Copper Co.—Sale of the Annie Laurie.

Information has been received from Pioche, Nev., to the effect that the contractors who will undertake the construction of the Pioche & Caliente railroad, are assembling equipment, and that grading of the new line will begin within ten days. Mining activity at Pioche is very pronounced at this time. A mining deal of considerable significance has been consummated whereby W. A. Clark, of Montana, has come into possession of the E. & F. company's mines, near Bristol.

The new mill of the Jennie Gold Mining Co., at Gold Springs, Iron county, has been placed in operation. Preparations are under way for the resumption of work at the Ophir mine in Stateline district. The property has been idle several years.

The Daly Mining Co., operating at Park City, has levied an assessment of 25 cents per share, or $37,500, to be used for development purposes. In the Naildriver mine a body of galena and carbonate lead ore has been opened in the east drift on the 950-ft. level. Shareholders of the Keith-Kearns Mining Co. have authorized the directors of that corporation to take steps toward a coalition with the Silver King Mining Co., and shareholders of the latter will meet in a few days to act on the same matter. It is proposed to organize what is to be known as the Silver King Amalgamated Mines Co., which will control something over 1,500 acres of territory in Park City.

It has been stated by reasonably good authority that Augustus Heinze and associates have secured an option on the Scheu silver-lead properties in the Good Springs, Nevada, district. An official statement from the management of the Columbus Consolidated Mining Co., of Alta, Utah, showed a cash balance on hand of $100,000 on April 1. Ore shipments have been light during the winter months on account of poor transportation facilities. This difficulty, however, will soon be overcome and it is stated that quarterly dividends of $60,000 will continue indefinitely.

Ore and bullion settlements as reported by Salt Lake banks last week amounted to $521,600.——High-grade silver-lead ore shipments continue from the Utah mine, of Fish Springs, Juab county. The last shipment netted $33,037, showing values of 151 oz. silver and 47% lead. ——The Beaver Copper Co. has been organized, with Henry Catcow as president, and A. J. Bettles first vice-president. This company has absorbed the Beaver Lake Copper Mining Co. Preparations have been made to conduct an active campaign of development. Heavy mine equipment will be installed. It is the intention to sink a double-compartment shaft to 500 feet.

During March the Newhouse Mines & Smelters corporation marketed 3,000 tons of concentrate and 500 tons of crude ore, from the Cactus copper mine in Beaver county. Regular shipments of ore are being made from the Cedar mine near Milford, which nets about $70 per ton.

Contractors working in the Butler-Liberal mine at Bingham have encountered a body of lead ore of shipping grade at a depth of 125 ft. in the Liberal shaft. Good headway is being made with the construction of the Ohio Copper Co.'s mill near the Dalton & Lark mine. Orders were placed with the Minneapolis Steel Machinery Co. for the structural steel some time ago, and the General Electric Co. has since been awarded the contract to furnish the electrical equipment.——At the receiver's sale of the Annie Laurie mine, this property was bid in by George Baird, representing the Kimberly estate of Sharon, Pa., for $220,000. The Annie Laurie mine is situated in the Gold Mountain mining district of Piute county. It is the intention of the new owners to operate the property in the future.

Denver, Colorado.

Woman's Invasion of Mining.—The Ibex Dump.—Crested Butte District.—E. E. Burlingame.—Ore in Depth at Cripple Creek.—El Paso Annual Report.—Zinc Resources of British Columbia.

The invasion of the fields of masculine endeavor by the eternal feminine seems to be destined to continue until there remains no stronghold that man can call solely his own. Cripple Creek is represented at the New York mining exhibition by a lady prospector and mine-owner, who attracts much attention. Next will come the lady miner, and then the masculine domination of our arduous profession will be at an end.

The Ibex dump at Leadville is to be treated. A feature of the new mill will be its system of distributed units for the furnishing of power, electricity being the power chosen. Card tables have been installed where one would usually expect to find Willleys. The fact that the Wilfley was for a considerable period far superior to any other type of table to be obtained has tended to prevent later tables obtaining the best opportunity to prove their merits. More recently many millmen have come to realize that the exposing of the fine concentrate to the unprotected action of the wash-water on coming to the end of the upper riffles is, with many ores, decidedly a disadvantage, and types of tables that do not possess this feature seem likely to establish themselves as soon as they become better known.

The Crested Butte district, in the west-central part of the State, is eliciting some present interest. This was, with the exception of Pikes Peak, the first district to be mapped and to have a geologic folio issued by the United States Geological Survey. While possessing some old producers of importance, the district at present languishes, partly because of the need of better transportation facilities.

In the death of E. E. Burlingame, Colorado has lost an honorable metallurgist, who for many years conducted the assay-office so well known throughout the West. Probably no assayer in the country was more favorably known, or bore a more enviable reputation. Mr. Burlingame was one of the old school of self-taught metallurgists; without formal training beyond a fundamental grounding in chemistry and assaying, he came as a young man to Central City in the early days and soon demonstrated his ability to such a degree that he was appointed Territorial Assayer. In 1876 he established the business that bears his name, and conducted it until five years ago, when the active direction passed more directly into the hands of his son. The sorrow of his family is shared by a wide circle of acquaintances and friends, who also feel the loss a personal one.

That Cripple Creek is not slowly sinking into a decline is shown by the recent strike on the 900-ft. level of the Gold Sovereign mine on Bull Hill. Thirty-five feet of good ore has been opened up and further development is under way. While undoubtedly the rich veins throughout this district will be fewer at a great depth, there seems no reason to believe that the impoverishment will ever be very marked.

The report of the Commission appointed to investigate the zinc resources of British Columbia contains much that is of interest to Colorado mining men. The portion by Mr. W. R. Ingalls, which takes up more than one-third the report, deals with the various ores of zinc; magnetic, electro-static, and flotation processes for their dressing; wet methods and smelting processes for the extraction of zinc; the design of a zinc smelter, and the valuation of ores. The description of the deposits by Messrs. Argall, Garde, and Barlow is of much value, as is the discussion of methods of assaying that follows.

The annual report of 1906 of the El Paso Gold Mining Co. has been received by the shareholders. The gross production for that period was a little over $800,000, being slightly lower than the estimates made before the close of the year. Dividends to the amount of $171,500 were paid during the year. The El Paso property, consisting of 70 acres, is situated on the west slope of Beacon hill, at Cripple Creek. Development work amounting to 4,400 ft. was done principally in the upper levels above the present water-line, which is at a depth of 600 ft. No new orebodies were encountered. S. S. Bernard in the report has included a list of the amounts pledged by the various subscribers toward the cost of the deep drainage adit, as the El Paso mine will be one of those properties most benefited in the driving and early completion of the adit. The amounts are as follows:

El Paso	$100,000	U. S. R. & R. Co.	$ 12,500
Mary McKinney	60,000	Eagle Ore Co.	5,000
Portland	40,000	Gold Dollar	5,000
Elkton	60,000	C. S. & C. C. D. Ry. Co.	12,500
Granite	15,000	F. & C. C. and M. T. Ry.	12,500
Strong	10,000	Work G. M. Co.	5,000
Golden Cycle	25,000	Gold Sovereign	1,000
Vindicator	15,000		

It is expected that the new cyanide tailing plant of the Portland mill at Colorado City will be ready for operation in April. The plant will have a capacity of 300 tons per day, treating the enormous dump accumulated from the chlorination mill. A belt-conveyor will be used to transmit the tailing from the dump to the mill.

London.

Gold Mining in India.—Results From the Three Big Mines.—Prospects in Depth.—Hopeful Spirit.—Esperanza Returns.—Continued Car Shortage. —El Oro Output. — Camp Bird Production. — Large Profits.

Three of the big Indian mining companies' reports have appeared this month—Mysore, Nundydroog, and Ooregum. At the twenty-seventh ordinary general meeting of the premier mine—the Mysore—the chairman was able to congratulate the stockholders on the results of the past year. These were recently referred to in my correspondence. Dividends aggregating in one year £418,674, equal to 14s. per 10s. share, or 140% on the issued capital, may well draw forth language of jubilation from the chairman of a public company. But his enthusiasm was even greater when he came to dilate on the bountiful future in store for the stockholders. Were it not for the chill shadow of the diminished returns in the neighboring Champion Reef mine, owing to impoverishment at depth, Mysore shares would probably stand at a higher price today than the $30 for the $2.50 share, although it must be owned that the present dividend yield of about 11% per annum on that figure is none too much. Reverting to present prospects, the underground developments during the past year are described as having exceeded in extent, importance, and value those recorded within any similar period in the history of the mine. The reserves of ore have been increased by 134,000 tons, making a total of 747,000 tons, or about four years' output. It is the hope of the directors that they will have 1,000,000 tons opened up as reserves in about two years more, and by that time Edgar's shaft—a perpendicular shaft going down through the country—will not only be finished, but, it is expected, also fully equipped and at work, and then with the increased reserves and greater facilities for hauling from the deeper levels, there is a prospect of still further increasing the already handsome returns. In support of these views the chairman reminded the stockholders of the scale on which the mine had been opened up. They had six main shafts distributed over a distance a mile long, and varying in depth from 250 to 3,500 ft. deep. In estimating the reserves, the chairman remarked that not one single ton of ore has been allowed to enter into the calculation below the bottom of the shafts or the bottom levels, and he thought they would see that the amount remaining available as reserves under foot is many times more than the actual reserves blocked out, so that, even if mining in depth were no longer possible, the life of the Mysore mine could be measured by tens of years. Many of the readers of the MINING AND SCIENTIFIC PRESS, obliged to keep within the limit of hard facts in daily practice, may regard this imaginative forecast as bold prophesying. Still it will serve to cheer the mining speculator on his way. He is often enough bewildered by professional stocktaking phraseology which leaves him in doubt as to whether he ought to 'bull' or 'bear' some particular stock. Having regard to the present assay-values found at the deepest points of the mine "lodes 4 ft. and 5 ft. wide worth 2 oz. and 3 oz. to the ton," the chairman of the Mysore could afford to make good sport of the pessimists. He remembered they were told that when they got to the bottom of the old workings at 300 ft. they would find the lode cut out. Another prophecy was made that it would disappear at 1,000 ft.; and three years ago in an article, written and also delivered before the learned societies, they were told for certain that the lode was going to cut out at the 3,000-ft. level.

The Ooregum has been the least successful of the three Indian gold mines mentioned at the beginning of this

articlе, during the past year. On a production of 68,881 oz. bar gold, dividends were paid amounting to £54,687. Compared with the previous year, although better results were obtained in respect of the grade of the quartz, the weight of gold won, and the reserves of ore opened up, there has not yet been a general improvement of a character sufficiently substantial to warrant an increase in the output during the current year. The appearance of the mine favors further developments at depth and for this purpose and to introduce improvements in the surface plant, the directors recommend an increase of the company's capital.

The directors of Camp Bird (Colorado) have reeeived a report on the working operations for the quarter from November 1, 1906 (the date on which the new mill of 60 stamps commenced crushing), to January 31. The following are extracted: The mill during the above period crushed 20,770 tons of dry ore; receipts from bullion sold (including cyanide products), $569,713; receipts from concentrate sold, $69,892; total, $639,605; less working expenses (including development, transportation, and treatment of product), $158,344, leaving $481,261.

The manager advises that on January 31 the value of the unrealized product on hand and in transit on that date was $89,297. There has also been expended on construction account for the above period, $5,768; for re-construction, $9,021. In order to regain the normal position of the company, and in accordance with the policy laid down by the chairman in his speech at the last annual meeting, the ore milled during the quarter was above the average. On January 31 the total dry ore broken in the stopes amounted to 108,246 tons. Everything at the mine and mills has progressed satisfactorily, and a high state of efficiency been maintained throughout. The report for February states that: The mill ran 27 days and crushed 5,331 tons of ore (dry weight), yielding 9,971 oz. bullion, and approximately 556 tons of concentrate. Amounts received from sales of product effected during the month as follows: Bullion (including cyanide bullion), $173,977; concentrate (681 tons), $38,695; total, $212,672; less expenses, $53,745. Balance, profit at the mine, $158,927.

Regarding the Nundydroog, the broad results of the company's operations for the past decade are set out in the following table:

Map of Mexico.

Year.	Quartz crushed. Tons.	Gold from all sources. Fine oz.	Net sum realized. £	Dividends. Per year. %	Dividends. Amount. £
1897	49,675	54,201	211,397	42½	93,500
1898	37,930	40,080	156,196	27½	63,731
1899	35,200	42,158	164,115	30	72,600
1900	37,460	46,798	182,518	33¾	81,675
1901	52,030	54,937	214,268	37½	90,750
1902	55,940	56,072	218,171	40	96,800
1903	66,860	67,912	264,458	45	108,900
1904	75,840	66,296	258,155	42½	102,850
1905	79,070	68,161	265,251	36⅔	100,580
1906	81,750	69,947	272,385	36⅔	103,767

Since crushing was commenced in 1882 the total amount of ore milled has been close upon 700,000 tons, yielding a little over 701,000 fine ounces, realizing £2,732,573, of which sum £1,241,027 has been distributed in dividends among the shareholders, representing about nine times the original capital.

February returns from two of the Mexican mines are announced. At Esperanza the mill ran 26 days, and crushed 11,942 tons of dry ore; shipped to smelter, 1,703 tons of dry ore; estimated realizable value of bullion produced, $125,222; estimated realizable value of concentrate, $53,286; estimated realizable value of ore shipped to smelter, $87,245, leaving $265,753; receipts from rents and other sources, $1,043; total, $266,796. Less working expenses, $139,752; allowance for depreciation of plant, $2,500; consulting engineers' fees and New York office expenses, $2,521, making $144,773; profit, $122,023. Feet of development work, 784; shipping ore on hand, 1,400 tons. The manager reports that the shortage of cars still continues.

The following is the February return of El Oro Mining & Railway Company:

The No. 1 and No. 2 mills both ran 27 days, and together crushed 20,306 tons of ore, producing	$163,278	
Less working expenses	$85,725	
Development expenses	8,274	93,999 or $4.63 per ton
		$69,279
Profit from railway		4,448
Total		$73,727

Butte, Montana.

General Resumption of Work.—Widespread Activity in Exploration.—The East Side.—Vigorous Search for Copper.—Butte & London.—Amazon-Butte.—The Reins Copper Co.—British-Butte.—Settlement of the Wage Question.—Satisfactory Result.

Since the settlement of the wage question all development work at the mines and construction work have been resumed and between 2,000 and 3,000 more men are now employed than a month ago. Work on the improvements at the Washoe and Great Falls smelters has been recommenced. The Anaconda Co. is sinking the shafts of the Anaconda, High Ore, and Neversweat mines, and the Coalition Co. is sinking the Rarus and Tramway shafts and cross-cutting from the 2,200 of the Corra, and is making a connection between the Tramway and the Rarus shaft. The Coalition is also doing a lot of development work in the Rarus, Minnie Healey, Corra, and Alice mines. The Boston & Montana is engaged in building its great hoisting plant at the Leonard and is sinking several of its shafts, besides being engaged in a lot of development work in the Leonard, Colusa, Pennsylvania, Mountain View, and other mines. Clark is pushing development work in the Stewart and Original, and the Trenton is doing a lot of development and exploration work in the Gagnon mine, while the Parrot has resumed sinking.

There is increasing activity in that part of the Butte district known as the East Side; several new companies recently began operations and the line of shaft-sinking now extends for three miles north and south. Among the exploring companies at work are the Butte & Bacorn, which is sinking three shafts; the North Butte Extension Co., the Butte & London, the Butte Exploration, Colusa-Leonard Extension, Bullwhacker, Amazon Butte, Ida-Montana, Calumet & Butte, Butte & Summit Valley, and the Amalgamated, the last being engaged in sinking a shaft and exploring the Greenleaf claim near the property of the Butte Exploration Co. All of them are working with machinery capable of going to a depth of 1,000 to 2,000 ft. Some of them will go 1,500 ft. before attempting to explore the ground for copper ore. The shaft of the Butte & London has reached a depth of 900 ft., at which point a small vein was cut, but it is believed to be the vein seen several hundred feet higher. The shaft at present is in hard granite and the company has increased its bonus system by offering the men $50 per foot for every foot in excess of 70 ft. made during a month.

The Amazon-Butte Co. is the first company on the east side to strike shipping ore. From the Gaynor shaft lessees are sending 20 to 30 tons of ore per day, some of it assaying as high as 15% copper. The main shaft is down more than 300 ft. To the east of the main shaft is located the big fault-vein on which the Bullwhacker is working, and it is the belief of mining men that the east and west veins will run into the fault at a distance of several hundred feet east of the shaft, and that at the point of juncture immense bodies of high-grade sulphide ore will be found. East of the Amazon Butte some property is being developed by the Calumet & Butte Co. Its shaft is now down about 500 ft. Stringers and small veins have been cut. Not more than 300 ft. from the Calumet & Butte, the Ida-Montana Co. is sinking a shaft on the Ida claim, and has reached a depth of 250 ft., where a station is being made. Both companies are owned by Duluth men and there is talk of consolidating them.

The Reins Copper Co., which has been developing the Combination mine lying between the Leonard and the Pittsburgh & Montana ground, is approaching a self-sustaining basis, as it is now making regular shipments of ore. Last week two cars netted the company $3,600, and the week previous two cars brought $4,500. Ore is being mined from the 800 and 1,200-ft. levels. Cross-cutting is being done from the east end of the property north toward the Ella claim, recently purchased, upon which there is a developed vein. The cross-cut will be continued north through 400 ft. of Amalgamated ground into another small claim owned by the Reins Co., known as the Louise. The Reins has a large indebtedness, which will prevent the company from paying dividends for some time yet.——It is reported that the British Butte Co., which owns some ground several miles west of Butte in an undeveloped area, is preparing for the installation of a lot of machinery for the purpose of beginning exploration work.

The settlement of the wage scales for the miners and smeltermen of Butte, Anaconda, and Great Falls for a period of five years is one of the most important things accomplished in the interest of the mining industry in Montana in many years. Under the agreements reached between committees from the unions and John D. Ryan, managing director of the Amalgamated Copper Co., the miners will receive $4 per day on and after April 1 so long as the price of copper remains at or above 18c. per pound. The smeltermen will also receive an advance in wages so that the average paid at all the smelters will be about $3.50 per day. Last November, when the mining companies voluntarily granted the miners and smeltermen an increase of 25c. per day, the raise applied only to smeltermen, who had been receiving less than $3 per day, and therefore did not affect the skilled men at the smelters. It was to equalize wages that a re-adjustment was granted. When the miners, a month ago, announced their intention to vote on an amendment to their constitution making the permanent daily wage $4, they were notified by Mr. Ryan that the Amalgamated Co. would not pay the increase, and that while the company, at the present price of copper, could afford to pay it, it could not pay the $4 scale should copper again fall below 18c., unless the company should confine itself to mining only high-grade ore, which would not be good for the life of the company. Mr. Ryan said the aim of the Amalgamated Co. is gradually to grade the ore lower in average so that eventually ore carrying as low as one per cent copper could be mined at a profit. An intimation was made that, if the miners amended their constitution to make the wage-scale of $4 permanent, all the mines would be closed. The amendment was voted by a large majority and instantly about 3,000 men employed

in development and construction work were laid off by the Amalgamated. A committee from the Miners' Union asked Mr. Ryan not to take any radical action until the matter could again be submitted to the union. He suggested that if the miners would call a special meeting of the union, and hold it in a hall large enough so that the gathering would be representative, he would await the further action of the union. He suggested the appointment of a committee with authority to agree on a scale of wages for a term of years. A similar suggestion was made to the mill and smeltermen. The meetings were held and the committees appointed. Mr. Ryan met the committees and the five-year contracts were entered into and signed. Considering the difference in the character and hazardous nature of their work, it is considered that the difference of 50c. per day between the miners and smeltermen is equitable. The minor demands of the smaller unions, such as the engineers, machinists, and other trades employed by the mining companies, have not yet been adjusted, but they are not considered important and will be easily arranged. Following the general increase of wages granted by the mining companies last November, there was a general increase in the cost of the necessaries of life in Butte, and to prevent another similar result the miners, smeltermen, and mine managers will use their united influence. Warnings have been given that, if business men and dealers again raise the prices of commodities, the miners, with the approval of the mine managers, will establish a supply-house of their own. With the permanent settlement of the miners' and smeltermen's wage questions, it is expected that all other labor troubles in Butte will speedily adjust themselves, as the two big unions have announced their determination to withhold endorsement from the smaller unions, whose oft-repeated demands have been responsible for constant unrest.

Leadville, Colorado.

Zinc Output.—Manganese Ore.—The Morocco Company.—Mining on Ball Mtn.—Zinc Plant at Buena Vista.—Ore Under the Blue Limestone.—Progress in Big Evans Gulch.—The Yak Adit.

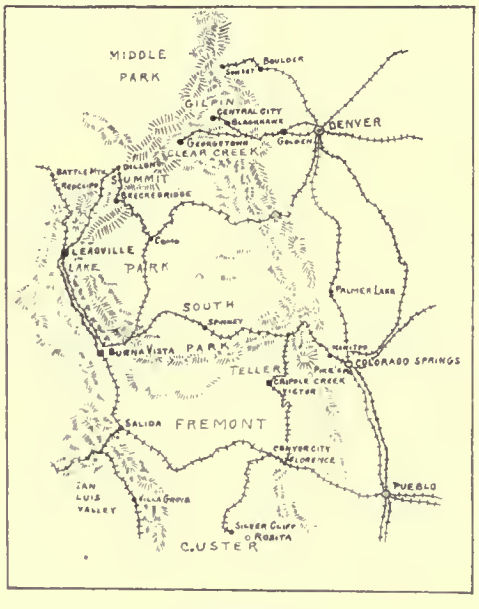
Local zinc producers are not seriously disturbed over the decision of the Board of Appraisers at New York, which, if adhered to by the higher courts, will admit zinc free of duty. The strong demand for this metal and the fact that Canadian and Mexican ores find a market through other channels, leaves little to be feared. Besides, zinc in the Leadville district has been for years a by-product that has been disposed of at a profit at a much lower price than the present quotations.

The failure of the Illinois Steel Works to renew its contracts for Leadville manganese has caused a notable falling off in the production of ore of that character. The above company is now drawing its supply from foreign sources, but the Colorado Fuel & Iron Co. consumes 15 carloads per month from the Morocco Mining Co., under an old contract. This tonnage has enabled the Morocco company to push developments to the west of Harrison Ave., and it now appears that this property will soon be producing an excellent grade of silver ore, instead of depending on their manganese alone for profit. It is rumored that certain steel works in the East will contract during the spring months for manganese in large quantities. There are a number of properties in the downtown district that are in a position to furnish large quantities of this ore. In fact, in former times, more than 60,000 tons annually has been produced by the district.

The lessees of the Sunday property on Ball Mtn. are at present sinking the shaft to cut the lower ore-horizon. The first large shipment since the property resumed operations came from the 125-ft. level. The shaft will be sunk another 200 ft. This property is a good example of the gold-belt mines, the ore being found directly in connection with the porphyry.

After driving an adit 180 ft., the manager of the Helen Gould property reports that a fissure vein was cut which promises to be fabulously rich. Development work in a limited way has been in progress on this property for several years.——The McCarty & Moore machine-shops have been given the contract to build all of the machinery, except the electrical, for the new zinc plant that is to be erected at Buena Vista. The plant will be operated under the Keunzer process and will draw its supply chiefly from Chaffee county mines.

Notwithstanding that some eminent geologists were formerly of the opinion that little ore could be expected below the blue limestone, the operators of the present day



A Part of Colorado.

realize that there is no significance to be attached to any particular limestone formation.

Limestones of any character in the productive areas of the district seem equally prolific, and the miner of today only requests limestone contacts with anything but granite. Quartzite and porphyry contacts are both good ore-horizons, with either blue (Carboniferous) limestone or white (Silurian) limestone, and as a matter of record, some of the most valuable discoveries of the past two years have been at the quartzite contacts.

Rapid progress is being made in the development work on the Boulder property in Big Evans gulch. This part of the camp of late years has experienced more difficulty from heavy flows of water than any other portion of equal area. Timothy Kyle, manager of the Boulder property, lately completed the installation of an efficient pumping and power-plant, with a boiler capacity of 285 h.p. Mr. Kyle sunk the old shaft on this property several years ago, when the last shots in sinking opened up an unusually strong water-course and stopped all operations until the present company undertook the work of development.——W. H. Covey and associates have done considerable work on the Hibschle shaft, between Seventeenth and Eighteenth streets, above Orange. A drift to the west at the 440-ft. level has encountered a substantial body of ore near the Elk fault, and 40 tons of ore are being sent to the smelter daily.——It is interesting to note in connection with the operations at the Yak adit, that an enormous amount of development work is in progress in advance of mining the ore. Thousands of feet of diamond-drilling is being done during the period of a single year

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE highest and broadest of the mountains and the chief part of the mass of the continents were lifted above the ocean mostly after the Cretaceous period.

SOLID METAL and rock, when under pressure, yield through molecular movement, and may thus become compressed, drawn out, flexed, and otherwise deformed.

A DRILL mounted upon a tripod is the combination commonly used for surface drilling, and even underground on the benches of railway tunnels, and often in stoping ores.

THE grander divisions of geological time are based, in a comprehensive way, on organic progress, independently of events connected with rock-making and disturbances of the crust.

THE term *vesicle*, as applied to a vapor-blown cavity in an igneous rock, has been put into another form in the word *lithophysa*, and applied especially to peculiar chambered cavities common in obsidian.

THE diamond-drill is a valuable apparatus for determining the nature of bridge foundations and the character of proposed canal or railway excavations, as well as in prospecting for valuable minerals.

HALLOYSITE is a hydrous silicate of alumina, like kaolinite, but amorphous and containing more water. It is a massive, clay-like or earthy mineral with a conchoidal fracture and showing little or no plasticity.

IN that portion of the United States formerly covered by the continental ice-sheet, there are occasional deposits of clay formed directly by the glacier. These are usually tough, dense, gritty clays, often containing many stones.

ON the amalgamating plates, the gold is caught earlier than the silver, since silver has less tendency to amalgamate than the gold, and hence the ratio of gold to silver in amalgam is less the farther the amalgam is from the battery.

IN some deposits of clay, the limonite or siderite collects around nuclei, such as pebbles or grains of sand, and grows into more or less symmetrical ball-like concretions, which are most abundant in the weathered portions of the clay.

IN a direct-current circuit the power in the circuit equals the product of the E. M. F. in volts and current strength in amperes, while in an alternating-current circuit the instantaneous power equals the product of the instantaneous values of current-strength and voltage.

IN the correlation of the rock-records, in view of the impossibility of determining true synchronism, Huxley proposed to designate by the term *homotaxial* those strata, in regions more or less widely separated, that have apparently the same relative position in the geological series

MANY rivers, especially in broad valleys, are bordered by a terrace or plain, there being sometimes two or more, extending like a series of shelves, or steps, up the valley-side. The lowest of these is often covered by the river during periods of high water, and is consequently termed the flood-plain.

THE leading idea in many magnetic separators is to secure a strong magnetic field by concentrating the lines of force as far as possible. This is done by placing the two poles of the magnet facing one another with a minimum air gap between them, and by beveling down the pole pieces at their ends.

PLASTICITY may be defined as the property which many bodies possess of changing form under pressure, without rupturing, which form they retain when the pressure ceases, it being understood that the amount of pressure required, and the degree of deformation possible, will vary with the material.

MERCURY TRAPS are pockets designed to catch amalgam and floured mercury that has drained off the plates. Incidentally, the traps always catch some heavy sulphides, and, although they do not have mercury put in them, yet the mercury soon accumulates, making them partake somewhat of the nature of mercury wells.

A STREAM of water can be thrown vertically 103 ft. and horizontally 96 ft., with a pressure of 100 lb. at the nozzle and 1⅛ in. diam. The nozzle will discharge 674 gal. of water per minute. With a higher pressure, equivalent to a higher head, the amount discharged and the distance to which the water may be thrown will be increased.

WHETHER a high-power or a low-power explosive is to be used in blasting, is dependent largely upon the use to which the rock is to be put, as well as upon the strength of the rock itself. Black powder, with its comparatively slow, heaving action, is used where the material is quite friable, as in mining coal or galena, or in excavating shale, hardpan, and similar material. A high-power explosive like dynamite is invariably used in tunnel-driving, shaft-sinking, and open-cut work in tough rock. It cannot be used for quarrying dimension stone, as it shatters the rock.

IN Blaine county, Idaho, is to be seen one of the most interesting occurrences of lava-flow that there is on this continent. Just south of the Lost River country, about 200 miles of what was an arid, sagebrush desert has been covered to a depth of from 20 to 600 ft. by a comparatively recent flow of black basalt, the age of which is estimated to be not over 150 years. So recent is it, that weathering influences have not had time to accomplish any surface alteration, and the rock stands as fresh and unchanged as when first erupted. The eruptions were of the quiet type, the lava welling up from central points, and flowing away on a gentle grade in all directions, but enough preliminary explosions and ejections occurred to build up a series of central craters, often 600 ft. high, forming an extremely rugged and interesting topography.

AN original location may be made upon vacant and unappropriated public mineral land at any hour of the day or night. As to such original location the law makes no inquiry as to the exact point of time at which it was initiated. Where, however, a re-location of a claim is attempted on the asserted ground of a forfeiture or abandonment of the original, the circumstances surrounding the re-location are proper subjects of inquiry. The Courts of California look upon 'midnight' locations of this character with suspicion as evidencing an intention to secure a right surreptiously. The original locator has the right to resume work at the usual hour for labor in the morning, and such resumption, if made, would defeat a location made secretly and surreptiously at an earlier hour in the morning. This is as far as the decisions have gone.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Sampling and Assaying.

The Editor:

Sir—I have read with considerable interest the letter of 'Enquirer' on this subject, published in the MINING AND SCIENTIFIC PRESS of March 16.

In my opinion, a man may be a first-class assayer on all ordinary gold ores, and yet get away off on some ore that appears simple, and requires either an unusual quantity of some special flux, or element, to free the gold from its combination in the ore.

In substantiation of this statement I will tell of one of my failures; which will read like a fairy story. A number of years ago, I accepted the position of assayer and mill-foreman at the Golden Gate mine, in Tuolumne county. The Golden Gate was strictly a concentrating proposition, yielding less than 2½% of its gold by amalgamation on the plates; and carried its value chiefly as telluride of gold associated with low-grade iron pyrite. The value was saved in the form of concentrate from the Frue vanners and a large canvas plant, to be treated by chlorination in the company's works at the mine.

Shortly before I began work the company had been repairing the roasting furnace at the chlorination plant, and had removed about a ton or so of common red brick from the floor of the furnace and substituted a floor of fire-brick. As the superintendent was about to make a shipment of some slag and clinker to the smelter, he told me to take a sample of the old brick, and see if it was rich enough to include in the shipment. I broke up a lot of the old brick and mortar, and got as fair a sample of it as I could without having it crushed; this I took to the assay-office, and crushed a sample through a 120-mesh sieve; I fluxed a couple of one-half A. T. charges with my usual flux, consisting of a heaping tea-spoon of litharge, two of soda, and flour, for about a 20-gram button, with a spoon of borax as a cover. The assays fused well, and gave a good clean fluid slag and nice soft lead buttons; these I cupeled, and was surprised to find that I had not even a trace of gold on the cupels; although I had previously tested the sample with a pan, and found a nice string of fine gold. Thinking that perhaps the bricks might contain tellurium, and needed an excess of litharge, I ran a couple of scorification assays, and cupeled them with the same result, of nothing. I then made another crucible assay; taking only one-fifth of an A. T. with my usual charge of flux. These buttons when cupeled and the gold parted gave me a fairly good check of $105 per ton. Being crowded with other work at that time I reported the value at that figure; and filed the sample away, to be kept one year, as was the practice at the mine.

About two years later, as I was discarding my old samples I came across the brick sample; and as I had more leisure, I repeated my one-half A. T. assay with the same result of not a visible trace. I examined the cupels carefully with a magnifying glass, but could not find a visible trace of gold, or any unusual appearance about them. I took and ground them up and fluxed them with an excess of borax, silica, and litharge, with flour, for a button. The result of this assay was two gold beads ranging in value between $120 and $140, and as near as I remember giving an average value of about $130. I then took the two cupels and combined them for a second assay. These gave me an additional value of about $20 per ton. An assay on the third set of cupels yielded a further recovery of nearly $5. Making the recovered value of the ore nearly $160 per ton.

I reserved the balance of the sample, intending to send it to some good chemist, who would make an analysis on the ore in the interest of science. A friend of mine recommended a well known assayer in San Francisco, and I sent the sample to him, telling him of my tests. He never acknowledged the receipt of the sample, or would reply to any of my letters enquiring about his results.

If any of your readers who live near Sonora are interested in the subject I would be pleased to have them obtain permission of the present owners of the plant and procure another sample and have it analyzed, publishing the result of the tests in the MINING AND SCIENTIFIC PRESS.

I think that perhaps a few little chips taken from any of the remaining red brick in the floor of the furnace, just back of the substituted fire-brick, might contain some of the same elements.

WILTON E. DARROW.

Sutter Creek, Cal., March 27.

Mr. Schurman's Philosophy.

The Editor:

Sir—Referring to an article under 'By the Way' in your issue of February 9, I would say that the astonishing socialism and unscience of Mr. Schurman's argument leaves one to wonder of what intellectual material presidents of colleges are made. In 1875 Professor Duhring of Berlin University published to the world a plan of socialism, which might have been the target for some of Mr. Schurman's criticisms, but this was utterly demolished by Frederick Engels in his masterly work, entitled 'Socialism, Utopian and Scientific.' Schurman's address does not show the slightest indication of acquaintance with evolution in the progress of animal or human life. He begins by approving as wise the quite anarchistic principle of *laissez faire*, deplores despotism, fears over-government, even for the positive promotion of the common interests of all members of society, and chides people for noticing the concentrating processes by which, in true gold-mill parlance, a few men get the richest concentrate, and the many workers the most barren tailing. All these remarks fail to touch scientific socialism at all. This science leads us along the course of evolution of racial customs in production and distribution of wealth, determining production to be a social factor, and bases political economy upon social interests, which require the elimination of non-producers from social consideration. How this works out in a perfect diagnosis of every good and evil of present-day industrialism, and the trend toward collectivism, like a great tide, not a cheap man-made bureaucratic plan, but an inevitable development of the fittest, is finely shown in Engels' work. If you cannot get it on the Coast, I will mail it to any of your readers for 15 cents. Schurman's attitude is that of a timid empiric. He does not know what he is dealing with, and if his fears, lest the people cannot take care of themselves without spoilsmen and geniuses whose cleverness runs only to disproportionate holdings, were to have governed the history even of the beggarly past, there would never have been any human progress.

The very weakness and hesitancy of such 'stand-patters' tell that they belong to a failing order. The resolute people who believe in carrying the principles that have won the mastery in other fields of science into the department of sociology will not be denied. I find that these proletarians have more science than the graduates of our bourgeois scientific schools, that they are full of energy and enthusiasm, where their opponents are

tame and sluggish, so that the forces of popular advance are sure to push them back.

To formulate academic objections to socialism will not stop those whose best word is action, and whose only use for objections is to overcome them. I myself feel twenty-five years younger since my interest was aroused to work in the great laboratory of social phenomena. And as for the class struggle, President Schurman's position reminds me of that of Balaam when he was asked by the prince of Balak to prophesy against the energetic new people who were threatening the dominion of Canaan. But there seems this difference, that Balaam had to prophesy the impending truth, and told the Canaanite prince "what this people will do to thy people in the latter days." Science is a greater prophet than Balaam, and she declares with unmistakable clearness just why no bribes of accumulated wealth, nor enchantments of vested privilege will avail to stay the proletarian tide.

CHARLES H. FITCH.

124 So. Grove Ave., Oak Park, Ill., March 26.

[We disagree heartily with the tone of this communication; but it appears just to publish it as a retort to the extract from Mr. Schurman's address.—Editor.]

Sampling and Assaying.

The Editor:

Sir—With reference to the experience of 'Enquirer,' it appears evident that the apparent discrepancies are due to one or more of the following reasons:

(a) Faulty sampling.
(b) Faulty preparation of samples.
(c) Faulty assaying.

(a) Faulty sampling: This probably accounts for the discrepancies between the results of the various 'experts.'

(b) Faulty preparation of samples: Unless, as you suggest in your editorial note, the ore has been put through a 100-mesh screen before dividing it between the different assayers, it is possible that the gold was distributed unevenly, thus explaining the more interesting discrepancies in the returns from the same sample.

(c) Faulty assaying: When samples have been assayed by an inexperienced man we have seen widely different returns from an ore containing a heavy proportion of pyrite. These differences have been due to the misuse of methods that require care. In the 'nitre' method there is sometimes a loss due to violent action in the crucible. In the 'iron nail' method there is occasionally a loss that can be traced to the formation of a brittle matte, containing gold and silver, which becomes scattered in the process of cleaning the lead button. Errors due to these two causes may be laid to carelessness, and do not prove that "assayers of established reputation" failed to get all the gold; they rather prove that the reputations of the assayers are not yet established for anything but cheap work.

Admitting that the facts are as stated by 'Enquirer,' it is natural to ask why the mill-returns were not accepted as controlling evidence of the value of the ore. The product of the mill is, after all, the crucial test. A point seldom considered by optimistic promoters of a mining sale, is that capital is not interested in a low-grade ore so complex that its precious contents cannot be recovered by the simple process of fire-assaying, since the ultimate recovery of 'dividends' from a sulphide ore depends in the end on the smelter man, who makes his settlement by fire-assay, and who has to employ this same process on a larger scale to reimburse himself.

There may be gold in sea-water and black sands. There is undoubtedly a great deal of silicon, aluminum, and iron distributed on the streets of San Francisco in the form of mud, but it lies untouched.

INVESTIGATOR.

San Francisco, March 26.

Pachuca.

The Editor:

Sir—In writing just twelve months ago in the columns of the MINING AND SCIENTIFIC PRESS an article on the Pachuca district, I drew a comparison of the valuation of three of the leading mines of the Pachuca and El Oro districts.

In that article I pointed out the lack of uniformity of valuation in the two districts, which feature it was surmised was mainly owing to the different ownership—the Pachuca mines being locally owned, while El Oro mines were foreign-owned. It was also pointed out that, if the latter group were justified in their valuation, that of the Pachuca mines was unduly low, and it was inferred that they were capable of a considerable increase of output and appraisement of value.

Since the writing of that article, much has happened, especially at Pachuca, and it may be of interest to note the comparative standing today.

	March, 1906. Valuation in pesos.	March, 1907. Valuation from shares and option prices.
PACHUCA.		
La Blanca	6,125,000	10,000,000
Santa Gertrudis	5,350,400	9,000,000
San Rafael	5,804,800	7,008,000
Total	17,280,200	26,008,000
EL ORO.		
El Oro	13,500,000	12,960,000
Esperanza	20,475,000	12,285,000
Dos Estrellas	30,000,000	21,000,000
Total	63,975,000	46,245,000

The ratio of valuation was as 1 to 4 in March, 1906.
The ratio of valuation is as 1 to 2, or less, in March, 1907.

To account for this considerable difference, it is to be noted that while the Pachuca district has risen considerably, judged by the valuation of the investing public, El Oro has shrunk materially. This is by no means discreditable to the latter—indeed, the record for the twelve months has been unsurpassed in the history of the camp, and placed it as the second largest producer on the American continent. During this period the Esperanza mine has maintained a monthly output of from $600,000 to $700,000, or an output of over a ton of pure gold per month for one year—a feat that has never been equalled in the history of gold mining by any individual mine.

If the purpose of mining is to extract the ore and put the bullion into circulation in the shortest possible time, then the policy of the Esperanza is correct, and in marked contrast to Mexican mining in the past, where the future was as much considered as the present. Consequently, the shrinkage of El Oro camp is occasioned by the rapid extraction of the ore, which governs the valuation of the mines. They are living their lives and living them merrily.

Be this as it may, this camp is but utilized for purposes of comparative valuation, and nothing more.

Returning to the Pachuca district, no one would venture to state that the considerable appraisement is the direct result of increase in ore reserves, which alone really governs the value of any mine; but it is rather the increased appreciation of these mines. In other words, the ywere unduly low in market valuation twelve months ago, which my article endeavored to point out. Now that fresh capital is being introduced and fresh interest awakened, the possibilities of this old—yet still young—camp are being recognized, and the probability is that, with the advent of further capital and cheap power,

Pachuca is yet in the initial stages of an upward movement.

Reviewing recent history, we note that the Real del Monte was the first to change hands at the beginning of 1906. Then an option was given on La Blanca, followed by an offer on the Santa Gertrudis group, which offer was apparently not satisfying to the shareholders, although a material advance on current prices. It is possible the San Rafael group may follow next—at all events, in sympathy with the forward movement, this mine has considerably increased in the public estimation during the period under review, and, as a matter of fact, in dividends on capital invested at the current prices during this period, it has far and away been the best paying mine in the district; although, of course, La Blanca has yielded the greater aggregate returns.

This brief retrospect is chiefly of interest as showing what a short twelve months is capable of producing in Mexico of today.

H. E. WEST.

Akmolinsk, Siberia, March 1.

[Mr. West's statement as to the output of the Esperanza is too high, for realization on the ore produced has been seriously hindered by shortage of railroad cars. But his remarks are interesting, and emphasize the importance of Pachuca as a mining district.—Editor.]

Mining in Siberia.

The Editor:

Sir—I note frequent references of late, in your London correspondent's letters, to the new Siberian mining ventures, in which a considerable amount of financial interest is manifested in London. Having had former experience in Siberia and in European Russia I feel qualified to express an opinion concerning that field as a future mining province. In the first place, it is rather a waste of space in an American mining paper to print news of so remote a country. To the American professional man operations in the great gravel mines of Siberia possess a certain amount of interest. The well-established practice there is, however, pretty generally known. On the other hand, to the American investor news of Siberia is like news from the Mountains of the Moon, and excites an equal amount of practical interest. Mining gold in Nevada, and copper in Montana, Arizona, and Michigan are at present sufficiently profitable enterprises. The American will not follow the Londoner in Siberian investments. There is no reason why he should, as there is plenty of undeveloped metalliferous territory nearer home; for example, Arizona, Nevada, Mexico, and Alaska. Why then should space be consumed in accounts of London board meetings when the only business discussed is the formation of a Siberian company or its troubles?

So far as Siberian enterprises themselves are concerned, it is rather surprising to see the utter ignorance which the average Londoner has of the country into which he is putting his money. Quartz-mining properties which have been thrown from pillar to post on the St. Petersburg and Paris markets for the past ten years are now seen masquerading under other names in London, apparently very well received.

There seems to be no discrimination in the investments; one hears of really meritorious East Siberian gravel properties on the same footing as the poor stringer-lead quartz mines of the Khirgese steppes and southern Ural. The two parts of Siberia are just as nearly comparable in point of richness and situation as a good drift mine in California and a quartz mine in northern Georgia.

There seems to be in many cases some anxiety as to the validity of Russian titles, and I would say that in the case of Russian mining 'concessions' such inquiries cannot be too carefully made. On the other hand, where Russian mining 'claims' are located or bought outright, no title in any country could be sounder. I have personally located and patented mining claims in Russia, as an American citizen. In the present Siberian flurry one hears little inquiry into the labor question, which seems rather important in any mining district. There are many kinds of labor in Siberia and the Urals, and eventually a good class of mining labor will be developed. This labor must be nursed, however, and the process cannot be undertaken through the medium of interpreters.

Siberia needs no apology and no defense. That it contains one of the world's greatest stores of accessible gold I have previously stated, and still maintain. The American engineer today who acquires a working knowledge of the Russian language will add a valuable asset to his equipment.

C. W. PURINGTON.

Munich, March 25.

Standardization.

The Editor:

Sir—In your issue of March 23, the recommendations of the Institution of Mining and Metallurgy, regarding the adoption of certain standards of weights and measures, are given and discussed. Doubtless all members of the profession would profit from the general use of these standards and will stand ready to adopt them wherever practicable.

The suggestion, with which your article ends, regarding the difficulty of properly describing or differentiating United States and Mexican currency, however, does not remove the difficulty complained of, except in the use of spoken and written words, where 'dollar' and 'peso' are so distinct as to allow of no possibility of misunderstanding, if regularly used to differentiate the two currencies. The main difficulty, however, is not in words, but in signs and figures. The dollar and *peso* are both indicated, by Mexicans as well as by Americans, by the '$' sign, so that it would be imperative to differentiate the figures by some other sign, or to continue in the present clumsy method of writing 'Mex.' or 'U. S.' after the figures, which, unfortunately, leads to the misunderstandings complained of.

To write 'dollar' or 'peso' in front of the figures is too clumsy to think of and has no advantage over writing 'Mex.' or 'U. S.' after the figures; and to forge a new sign for either coin, that the business world could be induced generally to adopt, is manifestly impossible.

The present writer, therefore, sees no better plan than to be more careful, *when using figures*, to write thus: $7.80 U. S. or $7.80 Mex., for which custom already gives us warrant.

The suggestion made a year ago by the MINING AND SCIENTIFIC PRESS, and repeated in your recent issue, that the words 'dollar' and 'peso' should be used respectively to distinguish between American and Mexican currency, has already borne some fruit, as evidenced by the greater care taken by many in the proper use of the two words, and it is still further to be urged that, in using the word 'dollar,' only American currency should be referred to, and that the word 'peso' only (and not dollar) should be used in referring to Mexican currency.

FRANK LONGMAID.

Boeme, Texas, April 4.

AN ABRAS, or orebody, so called by Mexican miners, is a small stringer extending outward from the main orebody, along a small joint or fissure, which, when met at surface, is most always followed downward, finally opening out into a pipe or chimney.

A Filing System For Mining Engineers.

Written for the MINING AND SCIENTIFIC PRESS
By WALTER S. BROWN.

The average mining engineer is much in need of a systematic and convenient method whereby he can instantly put his hand upon any letter, any piece of technical information, or any pamphlet or catalogue that is in his office. The system described herewith will answer these requirements and, once started, can be kept up with but little expenditure either of time or of money.

The system naturally divides itself into four parts, namely, correspondence, technical information, catalogues, and miscellaneous. Each division has its own card-index and filing-drawer.

Filing cabinets are of many styles and many makes, but there is no question that the vertical system is the best one. This system enables one instantly to place any letter, invoice, catalogue, document, or memorandum; or any collection of letters or papers about any given subject. It does not mix things but keeps together papers that ought to be together, in such a manner that they are instantly accessible. It is as easy to operate with a great many papers as with a few. For the initial unit the five-drawer combination cabinet, consisting of three filing-drawers and two card-drawers, is best. Each card-drawer has two compartments each of which will hold 2,000 cards, thus giving a total card capacity of 8,000 cards. Each filing-drawer will accommodate about 4,000 letters with their folders or the catalogues from about 70 firms, so that the first unit will be sufficient until the engineer has filed away 4,000 letters, 4,000 sheets of information or their equivalent in sketches, photographs, small drawings, etc , and the catalogues from about 70 firms. When this stage is reached, an additional unit containing four filing-drawers, can be purchased for about $20, and so on indefinitely. At a small additional cost the units can be fitted with a lock that will act upon all the drawers at one operation. The cards and folders should be of four different colors, white for correspondence, salmon for information, blue for catalogues, and buff for miscellaneous. The cards should be of 4 by 6 in. size. In case the numeric system of indexing is adopted, the folders should be numbered by the manufacturer, but the cards should be numbered by the engineer. A numbering machine costs about $12, but it is of great assistance, especially in numbering catalogues.

There are three principal systems of indexing, namely, the numeric, the alphabetic, and the geographic. Of these the numeric is by far the most accurate, the quickest, and in every way the most satisfactory. In the card-index it is necessarily the same as the alphabetic, but in every other respect it is far superior. It obviates the chances for guesswork or error in placing any paper, for there can be but one proper position for a folder with a number on it, while if the folder is designated by a name, it takes more time to find its proper position in the drawer, as this position is frequently determined by the fourth or fifth letter in the first word. Moreover, there is always the difficulty of knowing which should be the index-word. For example, should it be 'Transmission Rope' or 'Rope, Transmission;' should it be 'Hoisting Machinery' or 'Machinery, Hoisting'? The geographic system is applicable in special cases only.

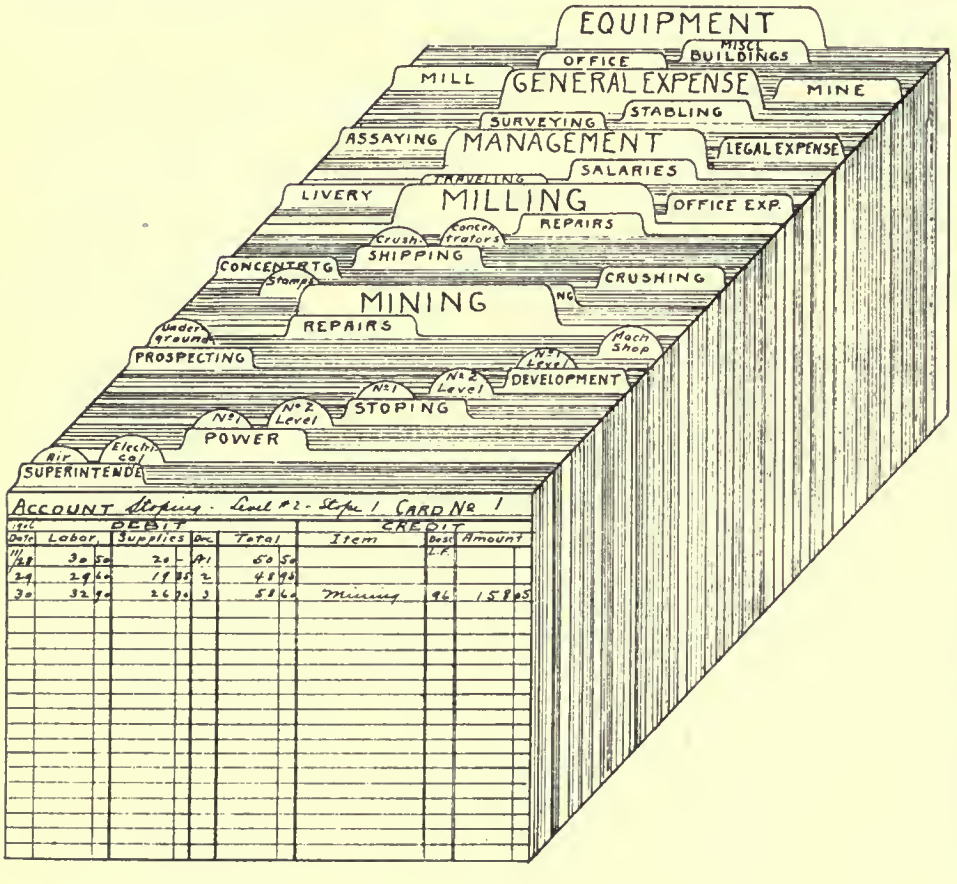


Fig. 1.

In filing correspondence, each correspondent is given a white card and a number. The card should have on it, the name and address of the correspondent, his filing number in the upper right-hand corner, a record of letters sent and received, and any other information the engineer may desire. In the correspondence-drawer, or drawers as the case may be, is a white folder with the same number on it that is on the card and in this folder are placed all letters to and from this correspondent, each letter or paper having on it the correspondent's number, the last letter being in front. To look up a letter from this person it is first necessary to get his number from the index and then simply find the correspondence-folder bearing that number. If it is desired, a card-ledger may be kept in the correspondence-index without interfering in any way with the correspondence.

The file for technical information is conducted in the same manner, except that cross-indexing is necessary. For example, suppose the engineer has the data showing the results of some tests on chrome-steel roll-shells. Then the heading of the index-card will read: 'Roll Shells, Tests on Chrome Steel,' followed by the number of the folder in which the information is to be placed. Then on another card will appear, as a heading: 'Materials,' and under this: 'Tests on Chrome Steel Roll Shells' followed by the number of the folder. On still another card will appear: 'Steels, Special,' and under this the same thing that is under 'Materials,' and so on, the more systematic and complete being the cross-indexing, the more valuable the index. Often it is desirable to put several bits of

memoranda in the same folder as, for example, all the information concerning a certain mill. But it should always be borne in mind that, unless properly cross-indexed, a certain memorandum may be filed away in a folder and completely lost unless the searcher takes the time to finger over the entire index.

In the catalogue file the index-card has, for a heading,

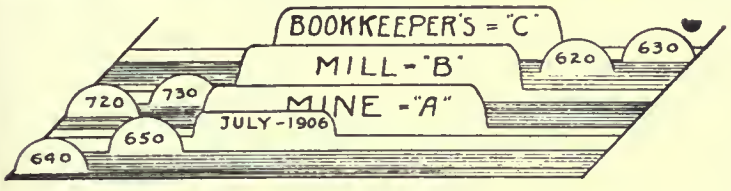


Fig. 2.

the name of the firm and its filing number. Then underneath comes the home address of the firm and the address of its nearest branch office or the name and address of the agent of the firm. Below this comes a list of what the firm handles and this may be followed by discounts on certain machines, terms, etc. as the inclination of the engineer may lead him. In the catalogue file too much stress cannot be placed on the necessity for thorough cross-indexing. The cross-index cards will have such headings as: 'Pumps,' 'Crushers,' 'Grinders,' 'Engines, Gas,' 'Engines, Steam,' 'Jigs,' 'Dredges,' etc. Large book-size catalogues are placed in the bookcase and a reference made to them on the firm's index-card.

The miscellaneous file will be arranged according to the dictates of the engineer. It may contain a town-index guide for one or more States, these guide-cards being obtainable for all the States, as well as British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, and Quebec, with a card for each town having a population of 200 or over. Or it may be a temporary index and contain a number of references on some important piece of work that the engineer may have in hand. Maps, especially those of the United States Geological Survey, may be kept in special map units and indexed either in the information index or in the miscellaneous index.

An engineer is, from his training and work, supposed to be precise and accurate, and it would therefore seem that he should be at least as methodical in his profession as the average business man. But how many engineers are there who can instantly find that scrap of information which they put away somewhere a few months ago with the vague idea that they might need it and which now they are so anxious to obtain?

Sampling of Ore.

Ores usually reach the reduction works or smelters direct from the mines, ranging in size from 12 to 16-in. cubes down to the smallest particles, and from 1 to 2% in hard ore up to, in some cases, from 20 to 30% moisture in ores containing clay or talc. As these ores are purchased outright from the mining companies the first process of treatment is weighing and sampling to determine the dry weight and the value of the ore. Sampling and weighing, thorough and correct, should, however, be done at all mills, more especially as automatic sampling has now been so far perfected that the exact value of the ore can be determined for a few cents per ton. Consequently there is really no valid excuse for any mill, however unpretentious, not having correct sampling devices to determine, without peradventure, the value of the ore before treatment, as well as careful and thorough sampling device for the tailing. Tailing samples alone will not show the losses in metallurgical works where there are many means of leakage besides the final one. With proper weighing and sampling of the crude ore the amount and value of the precious metals entering the works is determined; this with the bullion shipments and the loss in the tailing will soon show up other possible losses, and enable the metallurgist in charge to trace them and remedy the defects. I could give some extraordinary cases of losses, extending over years, and involving immense sums in the aggregate, that with proper sampling would have been detected in a month.—Philip Argall.

NAME Account No Card No.

Date	Item	Acc	DEBIT	CREDIT	BALANCE

Fig. 3.

Stoping July - 1906

Date	# Powder	#s Caps	ft Fuse	# Candles	Iron Steel	Gal Oil	Timbering	Lagging	Stulls			Report No.

Fig. 4.

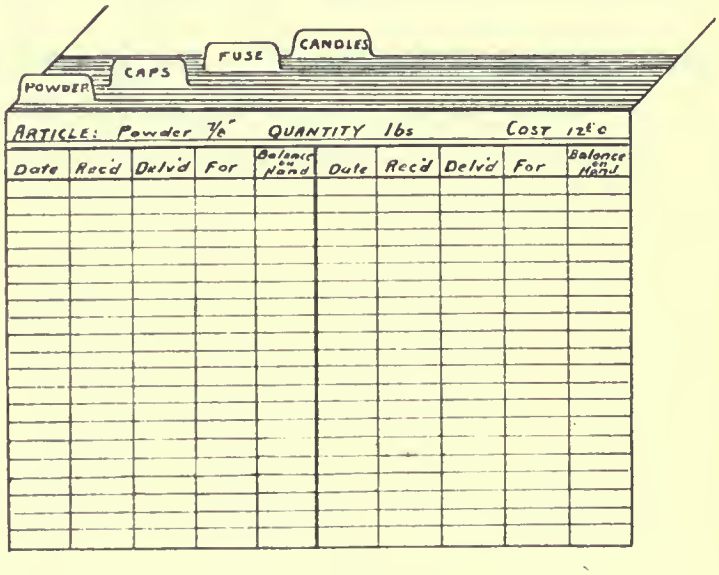

POWDER
CAPS
FUSE
CANDLES
ARTICLE: Powder 7/8" QUANTITY 1lbs COST 12½c
Date Rec'd Delv'd For Balance on Hand Date Rec'd Delv'd For Balance on Hand

Fig. 5.

The Cost of Labor on the Rand.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR P. RATHBONE.

Now that the result of the elections for the Transvaal Legislative Assembly is known and a ministry has been selected, I think it will be generally agreed that as far as concerns the gold mining industry of the Rand, it is better to have a sympathetic government behind it than the reverse. The latter was unquestionably the case when the Transvaal was a Crown Colony with a Liberal and Radical Parliament. Had the Progressive party, composed largely of the representatives of what is known as the 'mining groups' on the Rand, won the day, there can be little doubt that it would very shortly have found itself in conflict with the British Government when it came to deal with the various unskilled labor problems, connected with the employment of Kaffirs, Chinese, and one might add Indian coolies, seeing that all of them raise Imperial issues.

Thus, if a certain native policy were to be pursued it might result in a native war, requiring the assistance of Imperial troops for which British taxpayers would have to pay, while if another Chinese ordinance were to be passed by the Transvaal Government, the Imperial Government might in some way bring pressure to bear upon China, and if it is sought to stop the inflow of cheap Indian coolie labor, in the guise of British subjects, it might be necessary to interfere.

The Imperial Government has, however, been directly instrumental in placing the Het Volk party in power and at the present time the ex-general Louis Botha, Premier of the Transvaal, is to attend a conference of Colonial Premiers at the direct invitation of the Imperial Government, on which occasion he will, as he deserves, receive much attention.

Louis Botha, however, represents a large portion of his countrymen that understand how to deal with natives from a long and bitter experience far better than a ministry chosen from the Progressive party could possibly have hoped to do. Botha, as a sensible man, fully appreciates the fact that the Boer interest, which is largely agricultural or pastoral, depends upon the success of the mining industry, and he is therefore certain not only to do nothing to hurt it, but to do everything to help it.

The world's supply of gold depends very largely upon the Rand goldfields and, consequently, it is not the Boer farm-owner alone, who will look to Botha and his ministry to help them forward. Roughly speaking, gold, to the value of $125,000,000, is being taken out of the Rand mines annually; out of this $32,000,000 is absorbed by about 15,000 white skilled laborers, many of whom are miners, who remit large sums monthly for the maintenance of their families resident outside the Transvaal. Another twelve to fifteen millions is absorbed by some 80,000 to 90,000 natives, fully two-thirds of whom are also resident outside the Transvaal, mainly in Portuguese territory. Finally $6,250,000 is paid annually for 40,000 to 50,000 imported indentured Chinese coolies; this also must be largely expended outside the Transvaal. From this it will be seen that out of the total value of $125,000,000 representing the gold extracted from the mines in one year, fifty is paid away in wages for skilled and unskilled labor. Finally, allowance must be made for the cost of the stores, such as coal, explosives, timber, candles, native and Chinese food, new machinery, buildings, etc. A recent estimate showed that another $45,000,000 goes in this direction. Exactly what portion of this annual value of gold finds its way into shareholders' pockets, it is difficult to say, as frequently, the declared dividends have been derived largely from market operations and shares.

Any real appreciable reduction in the cost of mining can certainly not be looked for in connection with greatly improved processes for the extraction of the gold, nor from any mechanical improvements except they be carried out underground in connection with labor-saving appliances, such as, improved forms of rock-drilling machines and mechanical transport for the haulage of the ore to the shaft. Even these economic factors are insignificant as compared to a direct reduction in wages. On the one hand we find some 15,000 skilled laborers absorbing $32,500,000 while $20,000,000 is distributed for the payment of nearly nine times as many unskilled laborers, that is Kaffirs and coolies!

The unmarried skilled laborer who can live 'the simple life' on the Rand goldfields, can do so for about $50 to $60 per month, which includes his board, lodging, clothing, and a very small amount of luxuries; while the married man, with a small family, would require nearly double this amount. Roughly speaking, the ordinary skilled laborer is paid $5 per day, so that as an unmarried man it is evident that there is not much of a margin to put by for the inevitable 'rainy day.' The cost of living has of late years been considerably reduced, but it is evident that far larger reductions must be made before it will be possible to greatly reduce the account for white skilled labor.

The Kaffir and coolie laborers stand in a far more enviable position, although only paid $15 to $20 per month as against the white man's $125 or $150, seeing that he is not required to pay for food or lodging, while his clothing bill is scandalously low. In the case of the Kaffir also his wife, and even his children, help frequently to keep him, and not he to keep them.

In order to make many of the Rand gold mines pay dividends where they are not now doing so, it is essential that one of several things should happen.

1. The average value of the ore mined must increase.
2. The companies must be re-constructed on a different basis.
3. The cost of living for the white skilled laborer must be so reduced as to fairly permit of a reduction in wage.

There is no reason whatever to anticipate either an increase or decrease in the average richness of the gold-bearing rock; in fact, all evidence goes to prove that it will always remain about as it has done in past years, though naturally improved methods in mining and sorting the ore may result in raising the assay-value of the ore sent to the mill.

A hundred million pounds sterling, or $500,000,000 has already been taken off the capitalized value of the Rand gold mines by the continued decrease in stock quotations, so that should still further reductions have to be made, it will be a disagreeable and unpopular process.

The cost of living will undoubtedly be gradually reduced, but taking into account the distance of the Rand goldfields from the coast, and the somewhat inferior nature of the country for agricultural purposes, until much more is accomplished in the way of irrigation, it is certain to be a slow process.

AS THE initial step in the investigation of black sands from placer mines, the Geological Survey sent a circular letter to the placer miners of the United States, requesting them to send by mail samples, weighing four pounds or less, of the heavy-sand residues left in their sluice-boxes. Over 2,000 samples were sent in from 34 States and Territories, and from British Columbia, Mexico, and America.

The Washoe Smelter.

*The Washoe smelter is situated about two miles east of Anaconda. The site includes about 240 acres, and peculiarly adapts itself in topography to the efficient handling of material. By reason of its being on a hillside it is possible to make the level of delivery of the product of one building the level of the charge-floor of the next.

The ore treated comes principally from the Butte district, and is hauled by the Butte, Anaconda & Pacific Railway, a distance of 28 miles, in trains of fifty 50-ton bottom-dump cars to the railroad yards at East Anaconda. At this point these trains are split up according to their destination, that is, as to whether they go to the concentrator and sampling mill ore-bins, or to the storage-bins. In each case they are made up into trains of eight or sixteen cars, according to the size of engine to be used, and are carefully weighed before delivery to their respective bins.

The concentrator bins are of wood and steel construction and are divided as follows: Eight second-class ore-

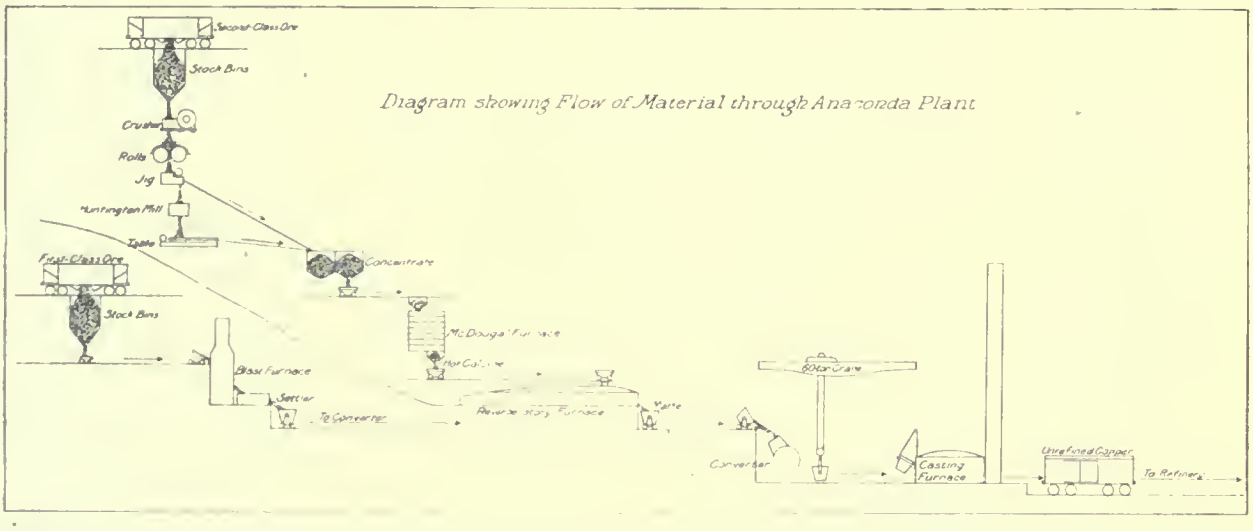


Diagram showing Flow of Material through Anaconda Plant

storage bins having a capacity of 1,250 tons each; thirteen sample ore-bins of 200 tons capacity each, and one coal-bin of 2,500 tons capacity.

The sampling mill is of wood construction throughout, and is 40 by 60 ft. and six stories high. It consists of two complete units, each unit having a capacity of 1,800 tons in 24 hours.

The ore to be sampled is taken from the sample-bins by an electric locomotive and dropped into bins feeding the crushers. The discharge of these crushers is elevated to the top of the building by means of bucket-elevators. The stream of ore is cut four times by Brunton automatic samplers, removing one-fifth of the amount each time and discarding four-fifths; the final result is 3.2 lb. for each ton of ore crushed.

The discard from the sampling machines is elevated and dumped into concentrator bins, or if it is first-class ore, it is sent to the storage-bins at the blast-furnaces. The final sample is quartered by a Brunton quartering shovel, the resulting sample dried on a steam-drier, ground in an Engelhardt sample-grinder, bucked so as to pass through a 100-mesh sieve, and made into three separate sample packages, one of which goes to the laboratory for analysis, one to the owner of the ore, and one is filed away for use in case of dispute.

The concentrator consists of two steel and wood buildings, each being 255 by 350 ft., and containing four complete units, or eight in all. Each unit is equipped with the same kind of machinery, and will handle 1,100 tons of ore in 24 hours. The equipment of one section is as follows:

1	12 by 24-in. Blake crusher.
2	7 by 10-in. Blake crushers.
6	Coarse concentrate Hartz jigs.
1	Set of 15 by 42-in. coarse rolls.
1	Set of 15 by 42-in. fine rolls.
36	Fine jigs (Evans patent).
1	Set of 15 by 42-in. middling rolls.
18	Middling jigs (Evans patent).
3	6-ft. Huntington mills.
18	Fine finishing jigs (Evans patent).
33	Wilfley tables.

Besides a large number of classifiers, settling tanks, de-watering tanks, elevators, and trommels of various sizes. A system of launders carries the concentrate to the settling tanks at the foot of the concentrator building.

The tank house is a frame building 70 by 670 ft. and contains nine settling-tanks for each unit. These tanks are 19 by 19 by 15 ft. high, each having a capacity of 120 tons of concentrate. These nine tanks are divided as follows: Six for first settlement of the concentrate, and three for second settlement of the concentrate, or, in other words, for settling the overflow of the first settling-tanks; the overflow from the second settling-tanks goes to three large tanks common to all units in that half of the mill; the overflow from these tanks going to the slime pond with the slime water from all the settling-tanks and Wilfley tables. The concentrate caught in the first settling-tanks is called 'fine concentrates;' that of the second settling-tanks is called 'second settlement concentrates,' and that of the third settling-tanks is termed 'tank slum.' The first two products are treated in the roaster building, the third at the briquette plant.

The slime ponds are situated in the valley below the works. There are six ponds of different sizes, but averaging about 300 by 630 ft., and the slime-water containing the greater metal values coming from the concentrator, goes to these ponds for settlement. When a pond is full, the water is diverted to an empty pond, and as much water drained off from the full pond as possible. The pond is then excavated by one of two Lidgerwood traveling cableways, each having a bucket capacity of five tons.

The slime is piled outside of the pond and allowed to drain and dry, and from these piles it is taken by cableway and dropped into a hopper on trucks, from which it runs into the railroad-cars beneath and is taken to storage-bins for use at the briquette plant. The slime-water containing the least values is used for condensing

*Abstract from a description prepared by the members of the Anaconda Copper Mining Co.'s staff.

purposes, and for sluicing slag at the reverberatories and blast-furnaces.

The settling-tanks containing 'fine' and 'second settlement concentrates' are emptied from the bottom, after draining, into the cars of the local tramming system and transported to the charge-floor of the calcine building, the material being weighed and sampled before dumping. It is the practice at this plant to weigh and sample the material entering and leaving every building, so that an accurate check is kept on the work of each department.

The roaster building is of steel construction throughout and is 96 by 412 ft. It contains 64 McDougal calcining furnaces of the Evans-Klepetko type. These furnaces have six hearths, 16 ft. diam., and are 18 ft. high; they have revolving water-cooled shafts and arms, driven by suitable gearing from the top. The rabbles are so set as to move the material from circumference to centre and the reverse, on alternate hearths until it finally drops into the calcine-hoppers immediately over the tracks of the local tramming system for transportation to the charge-floor of the reverberatory building. No fuel is used other than the sulphur in the concentrate, the burning of which furnishes sufficient heat to do the calcining, except on occasions when the furnace is not hot enough to ignite the sulphur, at which times fine coal is fed. The gases are taken through brick flues into large brick and steel dust-chambers, where a large proportion of the flue-dust is settled. This dust-chamber is so arranged that the bottom is a series of hoppers, so that the entire contents of the chamber can be drawn out into cars and sent directly to the reverberatory furnaces for smelting.

The material that sticks to the rabble arms, centre shaft, etc., called 'barrings,' is removed and sent to the blast-furnaces. Fine limestone and the screening from first-class ore in sufficient quantities to produce the slag desired in the reverberatories are charged with the fine concentrate through the feed-hoppers of the roaster for the purpose of getting an intimate mixture. Each furnace is capable of handling 45 tons of material in 24 hours.

The reverberatory plant consists of two steel buildings each 183 by 225 ft., each containing four coal-fired furnaces, the hearth dimensions of which are 19 ft. wide and from 102 to 116 ft. long, with a grate area of 8 by 16 ft. and a smelting capacity of 300 tons per 24 hours, on natural draft.

The fuel used is Diamondville coal, shipped from the mines in Wyoming, owned by the Washoe Copper Co. The coal is dumped into hoppers that have four points of discharge directly over the fire-box. It is the custom here to charge the furnaces from the first two hoppers next to the bridge-wall of the furnace and to use charges weighing about 15 tons.

The flame, after leaving the furnace, passes through two 375-h.p. Stirling boilers, in tandem, which reduce the temperature of gases going to the main flue to about 600° F. By this means 600 b.h.p. are obtained from each furnace from the waste heat. The ashes and partially burned coal drop from the fire-box into a stream of water, which carries them over a grizzly, the larger pieces of ash going to the slag-sluice, the smaller, containing coke and unburnt coal, being sluiced to the coke jigging plant, where the coke and coal are jigged out and the ashes sent to the dump. The coal and coke recovered are elevated to a bin from which they are taken to the briquette plant and there become a constituent part of the briquettes, thus obtaining a fuel value from an otherwise waste product. By this means 10% of the reverberatory fuel is recovered.

The slag is skimmed from the reverberatories twice in eight hours; it is allowed to accumulate until its depth is from three to four inches above the skimming plate in the front of the furnace and then skimmed into a stream of slime water, which granulates and sluices it through a cast-iron-lined launder to the slag-dump. By allowing the slag to accumulate in the furnace in this manner it is possible to skim the furnace rapidly, as much as 60 tons of slag being removed in 20 minutes. By this method the actual use of a rabble to 'pull' the slag is avoided, the rabble being used to keep the 'bay' clear of floating pieces of unfused silica and to prevent the flow being more rapid than the water can handle properly.

The matte is kept some distance below the skimming plate, making it impossible to 'pull' out any of the matte, thus avoiding explosions. The matte is tapped from the side of the furnace, through copper tap-hole plates, and run through cast-iron launders, lined with silicious material, to hot metal ladles of 10-ton capacity, and taken by the local tramway to the converters. The silica brick of that portion of the roof immediately over the fire-box (and for a distance of 30 ft. from the fire-box) lasts nine months and over. The brick is 15 by 6 by 3 in. It is the practice to clay, or fettle, the bridge-wall and sides where needed every 30 days. The bridge-wall plate is kept cool by a circulation of air by a pipe connection to the main flue. The utilization of the waste heat as a steam-producer and the saving of the coke from the ashes make a decided reduction in the cost of reverberatory smelting.

The briquette plant is a frame building 55 by 192 ft., containing four Chambers Brothers end-cut, auger-type brick machines, each machine having a capacity of 700 tons of briquettes in 24 hours. The briquettes are made of fine concentrate, fine first-class ore, pond slime, and fine coke from the reverberatory ashes. These materials are conveyed from the storage-bins by belt-conveyers to a pug-mill, from which they discharge into the brick machine proper, where they are further mixed and forced through a former by the auger of the machine in a continuous bar. This bar is cut into briquettes, weighing about 10 lb., by a revolving cutter peculiar to this type of machine. The briquettes are conveyed by a series of belt-conveyers to storage-hoppers, from which they are loaded into blast-furnace charge-cars as part of the charge.

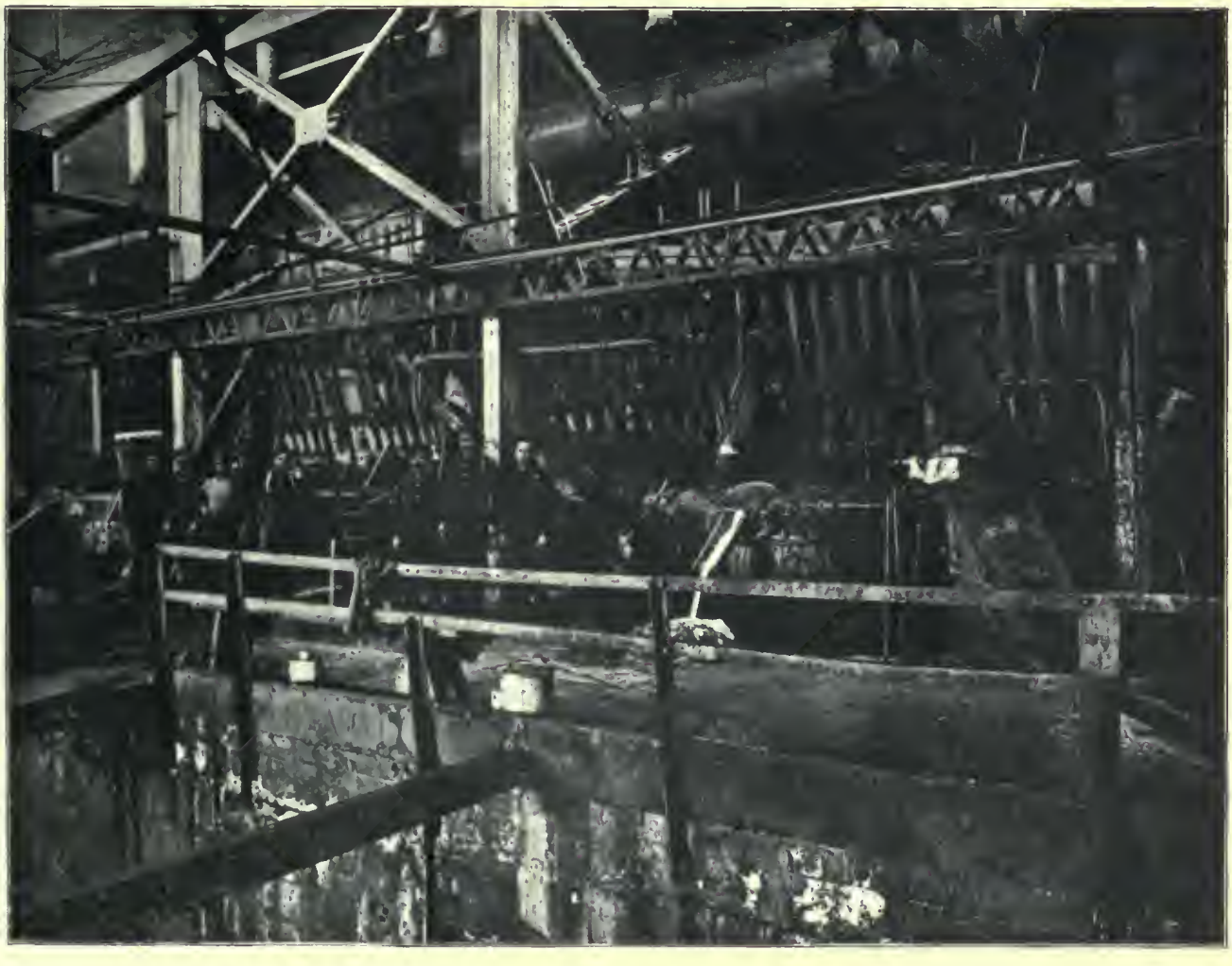
The blast-furnace building is of steel construction 82 by 269 ft. and contains three furnaces, two of which are 51 ft. and the other 87 ft. long, having a width of 56 in. at the tuyeres. The smaller furnaces have a capacity of 1,600 tons, the larger 3,000 tons of charge in 24 hours.

The bottom of the centre of the furnace is of silica brick, laid on water-cooled cast-iron plates, mounted on cast-iron columns, and has a gradual slope to each discharge spout. The 87-ft. furnace has three discharge-spouts and three settlers, but is otherwise built in the same manner as the 51-ft. furnace. The 51-ft. furnace has 88 four-inch tuyeres, and the 87-ft. furnace has 150.

The type of furnace used is the Mathewson patent blast-furnace. It is successful in operation and much easier to handle than the old style furnaces. Its advantages are that it has increased hearth-area with but two ends to bind and hold the crusts. Any crusts forming on the sides can be readily gotten rid of by allowing the furnace to run down, the crust either dropping or being readily barred. It has smaller radiating surface for the same hearth-area than the smaller furnaces, uses less coke, makes a flexible unit, because any part of the furnace can be handled as the case demands, and is susceptible of repairs without shutting down the entire furnace. Leaking water-jackets may be replaced without shutting down the furnace, thereby saving consider-

able time. It takes from six to eight hours to change a jacket. The procedure is to shut off the tuyeres on the jacket to be changed and the one opposite, allowing the water to circulate until all buckstays, tuyere pipes, etc., are removed, and the jacket ready to be pulled out; this chills a wall inside the jacket strong enough to hold the contents of the furnace. The new jacket is placed in position, all connections made, and the blast turned on and smelting resumed. The entire end of one furnace has been shut down, jackets changed, furnace cleaned out, and operations resumed; and during all this time (extending over ten days to two weeks) the other half of the furnace was in operation.

The circulation of the water through the jackets is as follows: Each individual tier of jackets forms a complete set with two feed-pipes and two discharge-pipes. In the case of the tier at the crucible end, the feed enters the crucible-jacket, the discharge from this going to the one immediately above, the discharge of this to the top jacket, from which it overflows to the waste-pipe. The 51-ft. furnace has three 7-ft. 45° unlined steel flues; the 87-ft. has five. All the flues discharge into a large brick and steel dust-chamber of the type adopted for the entire plant.



The Big Blast Furnace of the Washoe Smelter.

ASIDE from the kaolinization of feldspar by the ordinary processes of weathering, it seems possible that its decomposition may be brought about by the action of mineralizing vapors, as at Cornwall, England, where it was found that the feldspar of the granite on both sides of the tin veins, had been kaolinized. This change is attributed to the action of fluoric vapors, whose presence is pretty clearly indicated by the finding of such minerals as tourmaline and topaz.

IN EXPLAINING the deposits of lead and zinc ore in the Mississippi valley, H. Foster Bain says: The ores of this region are believed to represent concentrations of material originally disseminated through the surrounding rocks, particularly the Galena and upper Platteville beds. It is believed that the zinc and lead originally present in the crystalline rocks of the Lake Superior district were delivered by rivers to an especially favorable portion of the Ordovician coast, where in warm shallow waters they were partially concentrated by evaporation and were locally precipitated in quantity. The agents of precipitation were hydrocarbons or hydrogen sulphide, or both, derived from decaying masses of algæ of a peculiar type irregularly accumulated within certain shallow basins on the sea floor. The rising hydrocarbons continued to be effective throughout the period of deposition of the Galena dolomite. As the algæ matter became compressed the beds above broke and settled, leaving open spaces of peculiar form for the ultimate reception of the orebodies. The beds were slightly deformed, whereby the basins were accentuated and deep joint cracks were developed. The area was subjected to peneplanation and later to gorge cutting, whereby the overlying shale was cut away and a vigorous underground circulation was brought about. This circulation resulted in a concentration of the disseminated material, and, with the fall of ground-water level, the ores were successively reconcentrated until the present type was produced.

IN 1522 the mines of Tasco, Mexico, produced silver which was sent to Spain. This was the first silver sent from Mexico to a European country. The Tasco and Pachuca mines are the oldest worked mines in Mexico, the Aztec Indians having operated them at one time.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A coal, oil, gas, and mineral lease provided that the lessor was to receive a *pro rata* share of all the oil and minerals produced, and if gas should be found, then a certain rental from each well. The lease also provided that the lessee should begin a well on the premises within a year or pay thereafter an annual rental of $16. No well was ever begun but the lessee paid the annual rent which was accepted by the lessor. The lessor was entitled to forfeit the lease for a failure to develop the premises, but he could not do so until he had first declined to receive the rent and had demanded of the lessee a development of the premises.

Monarch Oil &c. Co. *v.* Richardson, (Ky.) 99 S. W. 668.

An action to enforce a construction trust in a mining claim arising out of the fraudulent acts of the co-owner of the plaintiff, was held subject to the limitations, that an action for relief on the ground of fraud or mistake, shall be commenced within two years after accrual of the cause of action.

Delmoe *v.* Long, (Mont.) 88 Pac. 778.

A sale of the mineral and the severance of the estate carries with it the right to remove or use so much of the containing strata, above and below, as may be reasonably required for the proper mining of the mineral. And where there are no restrictions in the grant, the space that may be left by the removal of the mineral and by the removal of so much of the containing strata as may be reasonably required for the operation of mining, remains a part of the property of the mine owner until the exhaustion of the mine, and may be used by him during the continuance of the estate as he may see fit, on condition that such user does no injury to the surface. This right to use the exhausted part of the mine includes the right to haul mineral and drain water through such space from other mines.

Moore *v.* Indian Camp Coal Co. (Ohio), 80 N. E. 6 (February, 1907).

In a contest between two claimants to a mining claim, whether the action assumed the form of a suit in ejectment or to quiet title, the purpose was to determine which of the claimants was entitled to a patent, and, in order to make the judgment effective, it must be based upon the complaint, the allegations of which would show facts justifying the entertainment of the action and the rendition of the particular judgment or decree. To this end therefore a complaint in such an action must allege that the adverse claim was filed in the proper land office within the sixty days allowed by the statute.

Thornton *v.* Kaufman (Mont.), 88 Pac. 796 (February, 1907).

The sale of the output of an oil well will be taken to mean the total output, and the seller cannot divert a certain proportion of the output for the remuneration of the furnisher of air-pressure in bringing up the oil. This rule was applied where it did not appear that such air-pressures could not have been secured by a money consideration.

Crusel *v.* Tierce (La.), 42 So. 940 (February, 1907).

Material defects in a complaint cannot be aided by matters in the replication. The replication is responsible to the new matter or counterclaim alleged in the answer, and while its allegations may in a particular instance aid the answer, they may not in any case aid the complaint. Thus a complaint to quiet title to a mining claim which failed to allege that the adverse claim was filed in the proper land office within the sixty days allowed by statute, was not aided by the replication which contained an averment of such fact.

Thornton *v.* Kaufman, (Mont.) 88 Pac. 796, (February, 1907).

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The mineral marked X. from Nevada City, Cal., is specular Hematite.

W. H. B., of Ruch, Ore., sends: No. 1, Magnetite; No. 2, Magnetite and slaty rock.

Specimen from Benson, Ariz., marked L., is a rock containing specular Hematite, the oxide of iron.

The two samples from Woody, Cal., marked J. W., are: No. 1, Clay; No. 2, Rhyolite Tuff. They are of no value for Aluminum.

The specimens from Autlan, Jalisco, Mex., marked A. B., are metamorphic Slate or Quartzite. No. 1 contains Pyrite, and No. 2 Chalcopyrite.

To Keep Iron From Rusting.

There are many causes of the rusting of iron. It may be produced by atmospheric action alone, but in a majority of cases galvanism plays a large part in the destruction of the metal. Long experience has shown how rapidly iron nails employed in fastening sheets of lead and copper upon roofs are destroyed, the other, the electro-negative metal, remaining comparatively unaffected. The electrolyte, or exciting fluid, which by acting on the iron and not on the other metal, or by acting more upon the former than upon the latter, causes the electric current, is either actual water from rain or snow or the water vapor always present in the atmosphere. The decomposition of the water causes the liberation of oxygen at the positive pole, which is the iron, and this nascent oxygen rapidly combines with the iron. Now, it is claimed that red lead is an excellent material for protecting iron from rust and electrical action. Unfortunately, however, red lead is more electro-negative to iron than either copper or lead. Hence, should moisture by any chance get between the red lead and the iron, the destruction by rust is more rapid than when iron is in contact with copper or lead. This electro-chemical action is at the same time strengthened by the purely chemical action between the red lead and the carbonic acid always present in the air, an action which converts the red lead into ceruse, whereby an additional quantity of nascent oxygen is set free to rust the iron. It is also highly probable that the carbonic acid has an independent action upon the iron, thereby much facilitating its oxidation. It must not be forgotten that every porous place and still more every crack in the paint becomes sooner or later an entrance for water and carbonic acid. A good oil varnish is by far the best protection for iron, but it must, of course, be properly used. Not only must the iron be scrupulously, practically, and chemically clean and dry when the varnish is applied, but the covering must be without a flaw. Varnish will not adhere to greasy, rusty, or wet iron, and the contraction of the varnish on drying will cause minute cracks at such places and the iron-destroying gases will find their way through these cracks and get between the iron and the non-adherent varnish. Again, the varnish must be thoroughly dry before the iron is exposed to the weather. The varnish may be colored if the color does not interfere with the strength, continuity, and elasticity of the protecting skin, but is best dispensed with.—*Architectural Art.*

Some Problems in Mining Law.

We have received the following queries:

A. An incorporated company owns say nine contiguous claims entirely and a two-thirds interest in another claim contiguous to the said group of nine claims. The tenth claim, a one-third interest in which is owned by an outside person, is so situated that development work done on it in the way of excavations (shafts, drifts, cross-cuts, etc.) will be a benefit to the entire number of 10 claims, or at least can be so directed, without detriment to the tenth claim in which the outside person is interested and and the one upon which the work is done for the entire number of 10 claims. It is desired to know whether the entire amount of work under these conditions required by the Government each year to hold the 10 claims or $1,000 worth in all ($100 for each claim), can thus be legally done on the tenth claim and so recorded, although there is an outside owner not interested in the other nine claims or whether his partial ownership in the said tenth claim would vitiate the purpose so contemplated for the benefit for the entire number of 10 claims and only be good for holding purposes under the Government law for the one claim upon which the work is done. For work done under such conditions, what portion can be charged the private owner of the one-third interest in the claim upon which the work is done for the entire number of 10 claims, without defeating the purpose of the work? Would a payment of $33.33 be all that could be required of him, or if he did pay more than the latter sum would it cause any complications with the other claims?

B. Again, suppose that the said incorporated company, for the aforesaid purposes, had for a number of years done each year upon the said tenth claim $1,000 worth of work recording the assessment work for the 10 claims as having been done in a shaft on the said tenth claim for the benefit of the entire number of 10 claims, would the said private owner have any clue or claim upon or interest in any way in the other nine claims owned entirely by the said incorporated company? Suppose that the said company had only charged the said private owner $33.33 each year, could a greater charge be made hereafter based upon a proportional share of a greater amount of work done or would the old pro-rata charge have to be made? Again, suppose the said tenth claim should be worked as a separate proposition and $1,000 worth of work should be done on it during any given year by the said incorporated company, can the said private owner be charged more than his proportion of the amount of $100 annual labor required by the Government or can he be forced to pay his share of the $1,000 worth of work actually done by the said company? How would it be where the work was all dead work? How would it be where pay-ore is struck, say enough to wholly or partially pay for the work done? What would be the procedure where enough pay-ore would be struck to pay a small or large profit on the supposition that the private owner has not agreed to stand any portion of the work but stands aloof only to pay his portion of the $100 annual labor required when the bill for this amount of work is presented? Can the incorporated company do more than the $100 worth of work required each year by the Government without the said private owner's consent, even if he is not charged for more than his proportionate share of the said $100 worth of work? These questions are all based upon the supposition that the interests of the said company and the said private owner in the said tenth claim are all undivided.

C. Would it place the status of the matters stated any differently, after the work is done as stated, to make separate records of the work done for the nine claims and the one claim (two separate affidavits) and to send the private owner a certificate of the County Recorder, relating only to the work done, an affidavit furnished for the one claim—nothing being said about the other work—even though it was all done in one place at the same time?

To these questions we venture to reply thus:

A. Assuming that the work done upon the tenth claim was obviously done for the benefit of the other nine in pursuance of a common system of development, the mere status of the title of the tenth claim would possibly not be material as against a mere re-locator. At the same time the Land Department would not entertain an application for patent for the 10 claims in one group. The ownership of the one-third interest in the tenth claim being in a third party would destroy the unity of title requisite to obtain patent to the entire group. It is also possible that in the proceedings to obtain patent for the nine claims in one group, the Department would not consider the work done upon the tenth claim as applicable to the other nine, by reason of the ownership by a stranger of a one-third interest in the tenth.

Other contingencies might arise that would isolate the work on the tenth claim and prevent its being utilized as a means of working the nine claims. The individual co-tenant might protest against using the underground workings in the tenth claim as a means of extracting ore from the nine, a right of the co-tenant that has been upheld in some of the Courts. Or partition proceedings might be instituted, which usually result in a sale. These are all potential possibilities rendering it unwise to concentrate group work on a claim where third parties are interested who have no interest in the remaining claims in the group.

Aside from the improbability of establishing to the satisfaction of the Department, the essential fact that work done on the tenth claim would necessarily tend to develop the other nine and the suggested complications which might arise, business prudence would suggest concentration of work at some central point or points within the nine claims and thus eliminate the element of uncertainty. In fact it would be less costly to do the work on each claim than to litigate an adverse title initiated upon the asserted ground that sufficient work had not been done in one claim to hold them all, or that the work done on one did not as a matter of fact tend to develop the others. These are often close questions, and claim owners should always keep a safe distance from the danger line. The expense of one lawsuit would more than cover the cost of unquestionable development work on all the claims.

B. The owner of the one-third interest would only be liable for one-third of the work required to be done on the tenth claim to protect it annually from re-location in the absence of any agreement on his part to contribute more, or in the absence of a local statute making co-tenants practically mining partners. If he voluntarily paid more he would not thereby acquire any interest in any of the other nine claims, unless there was an express agreement to that effect.

Under the facts stated the corporation and the individual are tenants in common of the tenth claim. Without his consent and unless there is some contractual relation, expressed or implied, existing between them, or some local statute, the individual owner cannot be forced to contribute anything beyond his pro rata of the annual assessment work. If the corporation without securing the assent or contractual participation of its co-tenant, sees fit to work the claim extensively, it cannot hold him responsible beyond his pro rata of annual work required by law to be done. If, however, a profit is made by the corpo-

ration, it would be required to account to the co-tenant for his proportionate interest. This is the general rule, which may be and sometimes is modified by local statutes which should be consulted.

C. The mere name in which proof is made of the performance of the annual work would not alter or affect the relationship or liabilities of the parties between themselves. It would be advisable to make two separate affidavits of performance of annual work, one covering the nine claims held under one ownership, the other the tenth claim.

Telluride Ores.

By WALDEMAR LINDGREN.

*Interesting questions arise upon comparison of the pre-Cambrian Kalgoorlie deposits with those of Cripple Creek, which are of late Tertiary age. At both places gold tellurides occur on a large scale. At Cripple Creek, however, Mr. Ransome and myself have shown† that the deposition of these tellurides was largely in the nature of fissure-filling, and that it was not a deep-seated process, but went on within or a short distance beneath the cone of a volcano at a moderate depth below the surface. At Cripple Creek it is the rule to find the tellurides in crystallized form, whereas at Kalgoorlie they are almost without exception in massive form. Tourmaline, magnetite, and albite do not occur in the Cripple Creek veins, but adularia is formed quite commonly together with sericite.

From these data it seems fair to draw the conclusion that tellurides of gold may be deposited in large quantities, both near the surface and at a depth of many thousands of feet below it. As far as Cripple Creek is concerned this is encouraging for the prospects of deeper mining.

There are several very remarkable analogies between the two districts. Both were discovered about the same time, Cripple Creek a few years earlier than Kalgoorlie. In both the rich zone is confined within a very small area—within a square mile at Kalgoorlie, and within a few square miles at Cripple Creek. Both have produced similar amounts of gold: Kalgoorlie approximately $130,000,000; Cripple Creek about $140,000,000. In both, finally, the deeper workings, which at Cripple Creek have attained 1,500 ft., and in Kalgoorlie, 1,900 ft., have shown a diminished supply of ore. If the conclusion established above is true this decrease of quantity of ore at Cripple Creek cannot be due to the gradual increase in pressure and temperature in depth during the ore deposition. It is much more probable that other causes were effective, such as rapid movement of the solutions in a few channels, contrasting with more stagnant conditions within extensively fissured and more open country nearer to the surface.

Neither is it probable that decrease of pressure and temperature appreciably influenced the deposition at Kalgoorlie within an interval of 1,000 or 2,000 ft. Here, also, the explanation of the ore-shoots is perhaps rather to be sought in local causes favoring an intimate penetration of the rocks by slowly moving solutions.

In the Mother Lode district of California, from Angels Camp to Carson hill and the Stanislaus river, are a number of large deposits, representatives of a certain type of the gold-quartz veins of that State. The Utica, Lightner, and Melones mines are the best known of those working on these deposits. A comparison of the metasomatic processes active here with those of Kalgoorlie develops some interesting points to which sufficient attention has not been directed. The lodes are contained in amphibolites and amphibolite schists like those at Kalgoorlie, and are characterized by F. L. Ransome as follows: They are "in the main complex stringer leads. But the country-rock is usually much more altered, and may be heavily impregnated with pyrite near the vein. It is often changed to a soft grayish rock consisting chiefly of carbonates of lime and magnesia, with sericite, and sometimes a little chlorite. Such altered and pyritized country-rock is too poor in gold to pay for working alone, but is often run through the mills for the sake of rich stringers which intersect it. These veins are usually richer in carbonates than those in the black slate areas, and in certain parts of the district are rich in tellurides." Mr. Ransome further mentions the occurrence of albite in the quartz filling of the veins, as well as in the ore resulting from the replacement of the amphibolite, and describes the tellurides, coloradoite, petzite, hessite, melonite, calaverite, and altaite, which occurred at Carson hill intergrown with free gold. A recent examination of a suite of specimens from Angels Camp and Melones shows that some of the altered rocks consist of sericite, with embedded grains of calcium-magnesium-iron carbonates and pyrite. In other places the carbonates prevail over the sericite, while in a third and very common type much of the sodium, abundant in the amphibolite, has been retained as albite in the altered rock. Large grains of carbonates are separated by a granular mass of quartz, albite, pyrite, and sericite.

At the Melones mine a specimen was found to contain sharply defined octahedrons of magnetite, embedded in the usual sericite felt of the altered amphibolite; this is, I believe, the first instance recorded of the occurrence of a magnetite as a product of rock alteration in a California gold-quartz vein. Tourmaline has not thus far been found.

The California veins are, as well known, of early Cretaceous or late Jurassic age, and were formed at a considerable depth below the surface. The remarkable similarity of the rock alteration at the Mother Lode mines to that at Kalgoorlie shows conclusively a deposition of the gold-bearing veins from solutions practically identical in their general composition.

*Abstract from paper on 'Metasomatic Processes in the Gold Deposits of Western Australia,' by Waldemar Lindgren in *Economic Geology*.

†'The Geology and Gold Deposits of the Cripple Creek District.' Prof. Pap. 54, U. S. Geol. Survey.

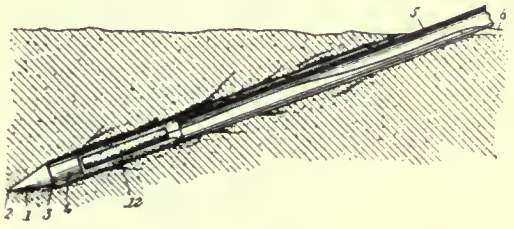
THE possibility that intense electrical waves used in wireless telegraphy may cause sparks to pass between conductors where they are not expected has been pointed out, but up to this time no disaster had been attributed to this effect, as the probabilities are much against it. Now, the mysterious accident which caused the blowing up of the French war vessel *Jena*, is attributed by a French wireless expert to this cause. The reasons for the charge have not been given in full, and until they are heard, judgment must be suspended. It may, however, be pointed out that the magazine of a war vessel would be the last place where one would expect to have trouble from this source. The vessel itself is a nearly perfect metallic shield, through which no electric wave could pass. To produce sparks within a metallic hull it is necessary that the source of waves shall itself be within the same inclosure, and even then the bulkheads should, under normal conditions, be effective screens.—*Electrical Review.*

RESIDUAL CLAYS, usually of ferruginous character, are found in many portions of the United States, but reach their maximum development in that portion lying east of the Mississippi and south of the southern margin of the ice-sheet of the glacial epoch.

MINING AND METALLURGICAL PATENTS.

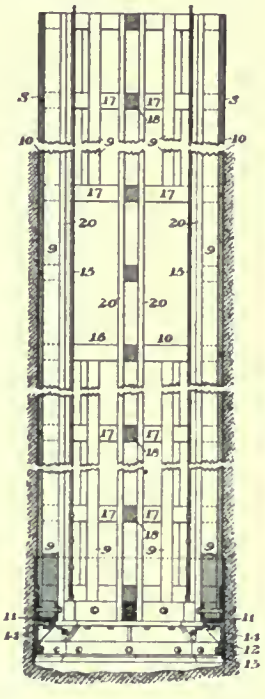
Specially reported for the MINING AND SCIENTIFIC PRESS.

DEVICE FOR INSERTING EXPLOSIVE CHARGES.—No. 848,512; Rosendo Torras, Brunswick, Georgia.



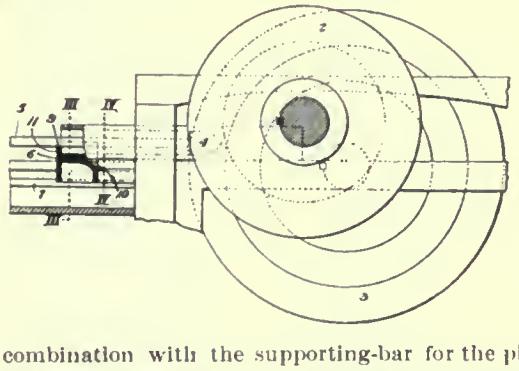
A device for inserting explosive charges, comprising a tube having a groove the entire length thereof, a pointed head detachably connected to one end of the tube, a head having a sharp point, a cylindrical shank portion fitting within one end of the tube and a shoulder fitting the end of the tube, and a cap adapted to be inserted in the other end of the tube.

APPARATUS FOR SINKING SHAFTS.—No. 846,816; Ralph Baggaley, Pittsburg, Pennsylvania.



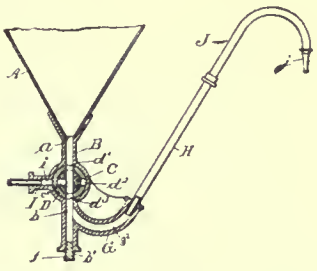
Means for sinking shafts including a permanent casing suspended from its lower end and made up of superimposed sections capable of being assembled as the casing is lowered.

BLANK-SUPPORT FOR TUBE-MILLS.—No. 848,285; George H. Blaxter, Beaver, Pa., assignor to Pittsburgh Seamless Tube Company, Beaver Falls, a Corporation of Pennsylvania.



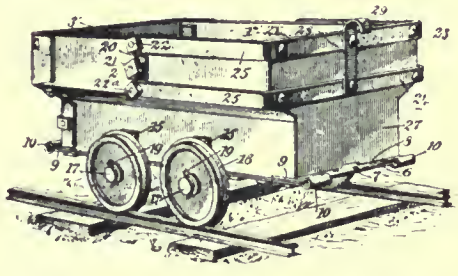
In combination with the supporting-bar for the plug or point of a piercing-mill, a bearing slidingly mounted parallel with and underneath the bar, and provided with an open top, and a lower portion adapted to engage and support the hollow billet

SETTLING-TANK.—No. 845,520; John M. Callow, Salt Lake City, Utah.



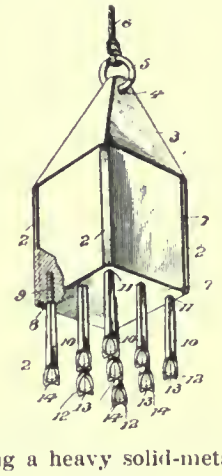
In a settling device, a tank provided with a discharge-opening, an exit-casting attached to the lower end of the tank and having a vertical channel connecting with the opening in said tank, a connecting-pipe, said pipe and the casting having a lateral outlet-passage connecting with the vertical channel through said casting, said discharge elements being provided with a valve-chamber, a three-way valve therein, means to operate the same, and a pressure-pipe connecting through said valve with the channel and with the lateral outlet.

MINE-CAR.—No. 842,670; Charles A. Keller, Rosedale, Indiana.



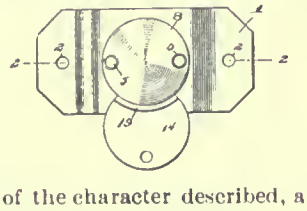
In a car of the class described, in combination, a body having a movable door, a bail attached to said door, and means for pivotally connecting the bail to the car, whereby the door may be swung to the outer side of the opposite wall of the car.

CHURN-DRILL.—No. 848,502; Josiah B. Scovell, Duluth, Minnesota.



A drill comprising a heavy solid-metal block, and a plurality of downwardly extending cutting-bits secured within the lower face of said block.

CHECK-LOCK FOR MINING-CARS.—No 848,441; Charles A. Cabell, Carbon, West Virginia.



In a device of the character described, a lock having a corrugated key-recess, and a curved groove extending into said recess, in combination with a corrugated key, said key having a curved slot, and a ball in said groove.

The Garfield Mill of the Utah Copper Company.

Written for the MINING AND SCIENTIFIC PRESS
By L. H. BEASON.

The concentration of ore from Bingham will begin next week at Garfield, the new smelter town, 15 miles west of Salt Lake City. The first section of the Utah Copper Co.'s gigantic plant is now ready for operation. The work of trying the machinery has been proceeding for a week or more by the use of temporary power provided for that purpose. Work on the second section is progressing rapidly. The operation of this new mill will undoubtedly be watched with keen interest by metallurgists throughout the country, for the reason that it is almost alongside the plant of the Boston Consolidated, which is being constructed on an entirely different plan, although the ore to be treated is identical in character. The Utah Copper will crush the ore with rolls and Chilean mills, whereas the Boston Con. will use stamps of the Nissen type.

The plant of the Utah Copper Co. is designed for a capacity of 6,000 tons of ore per day. The dimensions of the main building are 600 by 508 ft., this covering two sections, each of 3,000 tons capacity. The main receiving bin has a capacity of 46,000 tons, and there is another bin for crushed ore, that will hold 14,000 tons—a total storage capacity of 60,000 tons.

Operations will be divided into three departments—coarse crushing, fine crushing, and concentrating. Each section has its own coarse-crushing department, containing two No. 7½ gyratory crushers with a capacity of 100 tons per hour—a total of 400 tons per hour reduced to ¾-in. size. In each department there are two 54 by 20-in. roughing rolls.

The fine-crushing department for the entire mill will contain 36 six-foot Chilean mills and 20 sets of 16 by 36-in. crushing rolls; also the necessary feeders, elevators, and screens.

The concentrating department for the entire plant is built on three floors, each successively lower. These floors have an area of 120 by 600, 164 by 600, and 120 by 600 ft., respectively, the total area being 242,000 sq. ft., or approximately 5.6 acres of reinforced concrete. In this department will be placed 72 jigs, 48 Wilfley tables, and 1,104 six-foot vanners of the suspended type, being a modification of the Johnston concentrator. This department will contain 24 four-compartment classifiers and 384 nine-foot conical settling-tanks.

The total area covered by the main building and ore-bins is approximately seven acres, the total floor space in the main building being over eight acres. The total area covered by shops, warehouses, yards, reservoirs, etc., is about 20 acres. The machine-shop, equipped with every modern appliance, has a ground area of 100 by 56 ft. The carpenter-shop covers an area of 48 by 72 ft. The warehouse is 100 by 52 feet.

The mill is so designed that each of the 3,000-ton sections is made up of six units of 500 tons capacity each, making 12 such units in the entire plant. Each one of the units is a complete mill of itself, that is, any of them can be run independently of the others, each having its independent power. By this arrangement, a steady output can be maintained whenever repairs become necessary.

There are two storage reservoirs—one for low-head service and one for affording a high head. The former is 380 by 180 ft., and has a capacity of 6,000,000 gal. The high-head reservoir is 100 by 50 ft., and has a capacity of about 500,000 gal. water. The power-plant will have sufficient capacity to supply power for the Garfield works, as well as for the mine and mill at Bingham. To supply the latter, a transmission line 17 miles long has been constructed. The power-plant contains 20 water-tube boilers having a capacity of about 600 h.p. each, a total of 12,000 horse-power.

The engine-plant consists of five reciprocating engines, directly connected to high-potential alternating-current generators. Two of these sets are of 1,500 kw. capacity each, the other three being 2,250 kw., or 13,000 h.p. The dimension of the power-house building is 288 by 158 ft. There are two reinforced concrete stacks in connection with the steam plant, each 12 ft. inside diameter, and 180 ft. high.

The pumping plant, designed to supply water from the source of supply near the power-plant to the reservoir near the mill, consists of three electrically driven direct-connected turbine pumps, having a combined capacity of 10,500 gal. per minute.

The Utah Copper Co.'s enterprises, with which the Guggenheims, or American Smelting interests, are identified, are under the general management of D. C. Jackling. R. C. Gemmell is general superintendent and Frank Janey is superintendent of mills.

The contract for the first-section building was let to the Minneapolis Steel & Machinery Co., of Minneapolis, Minn. When it was decided to double the capacity, that is, add 300 ft. to the mill, this firm also secured that contract. For the whole plant, over 4,000 tons of structural and corrugated steel have been used.

ELECTRIC HEATING.—A large number of industrial processes depend upon the production of high temperature by fuel heating. In many of these cases, in the course of general advance in practice, the limit of temperature aimed at has tended to rise considerably; but it has, unfortunately, seldom been possible to prevent a corresponding decrease in the efficiency of the utilization of the coal. In this connection, remarkable progress is being made in the application of electricity for the production of high temperatures. Serving, at first, solely for the initiation of new industrial processes, demanding temperatures quite beyond the scope of fuel heating, electric heating is already being widely applied in cases where the temperatures required are just within the limit attainable with gas or coal firing, and the general tendency is undoubtedly toward its use for still lower ranges of temperature. The chief advantages of the application of electricity in this connection may be said to lie in that it enables the heat to be generated where it is required — inside, rather than outside, the chamber containing the material to be heated; in the simplicity of a delicate regulation of temperature; in the ease with which the furnace or kiln can be provided with a really efficient heat insulation, capable of minimizing the thermal losses to the outside air.— R. S. Hutton.

THE recent statements made by the trust companies of the State of New York are illuminating. The statements are made as of February 26, 1907, and they may be compared with the statements as of February 20, 1906. This year these trust companies owe to their depositors in round numbers $23,000,000 more than in 1906. A year ago the reserve against their deposits, which were then quite a little in excess of $1,000,000,000, was held with approved reserve depositories to the extent of $118,000,000. This year the amount so held is $94,000,000, a decrease of $24,000,000. But the cash items, namely, specie and legal tenders and national bank bills, held by these trust companies in February, 1907, amounted to $59,000,000 as against only $23,000,000 in 1906. Here is an increase in actual cash holdings of $36,000,000. Of this increase in cash holdings the sum of about $31,000,000 is increased specie.

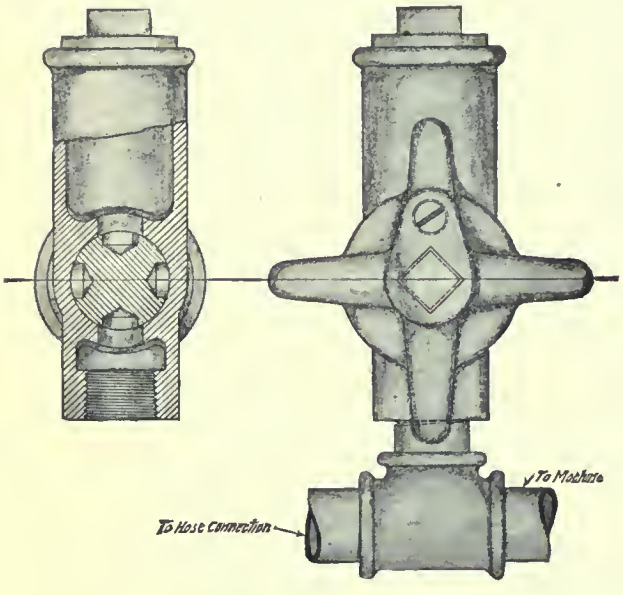
New Mill of the Utah Copper Company.

In the distance is the Wasatch range, at the base of which is Salt Lake City. In the middle distance is the alkali waste made by the recision of the lake.

Rock-Drill Lubrication.

Strange as it may seem, until recently there was little attempt on the part of rock-drill manufacturers to provide means for efficient or economical lubrication of the machine, and even now the devices in use are remarkable, not for their fitness, but rather for their crudity and wastefulness.

In the Chicago Giant rock-drills the Chicago Pneumatic Tool Co. provides means for automatic lubrication, but, as there are thousands of rock-drills of other designs in use, which are wearing away their lives in needless friction, this company has designed an independent rock-drill oiler (shown in illustration) which can be attached to the hose



connection by using a standard pipe nipple and T. This device is constructed so that at each quarter turn of the star-wheel a defined quantity of oil is delivered and passes into the drill with the operating fluid. The upper part of the oiler-body is made to form a reservoir-chamber for the oil, and is of sufficient capacity to hold from 50 to 60 'doses,' which are measured out to the drill by turning the star-wheel. One filling of the reservoir-chamber will last a day's run, allowing one dose to the machine at each change of steel or more frequently if deemed necessary. The position of the arms on the star-wheel coincides with the position of measuring pockets in the oiler, and provision is made for automatically latching in the proper position at each quarter turn of the star-wheel. As everyone who is familiar with mine work knows, rock-drills have to be operated where the light is poor, and also that in all conditions of drilling, on the surface or underground, there always is an abundance of dust or grit; consequently, with the old system of oiling, the machine was liable to get ingredients introduced with the oil that caused grievous trouble in its internal organization. To prevent this we have provided a strainer in the mouth of the filling-chamber, which can be easily removed for cleaning when necessary.

The addition of a small quantity of flake graphite to the oil will be found beneficial. The graphite and oil should be mixed as thoroughly as possible before placing in the oiler. One teaspoonful of fine flake graphite to a pint of oil will give good results. The mixture should be well shaken before filling the oiler, then the vibration from the operation of the machine will keep the graphite in suspension in the oil when it is in the reservoir.

Technical Schools.

THE UNIVERSITY OF ILLINOIS is sending out a leaflet describing the 'School of Railway Engineering and Administration.'

Commercial Paragraphs.

ALLIS-CHALMERS CO. announce the opening of a new branch office at 316 Godchaux Bdg., New Orleans.

T. H. PROSKE, of Denver, manufacturer of the Ajax drill-sharpening machine, recently shipped one of his machines to St. Petersburg and one to Berlin.

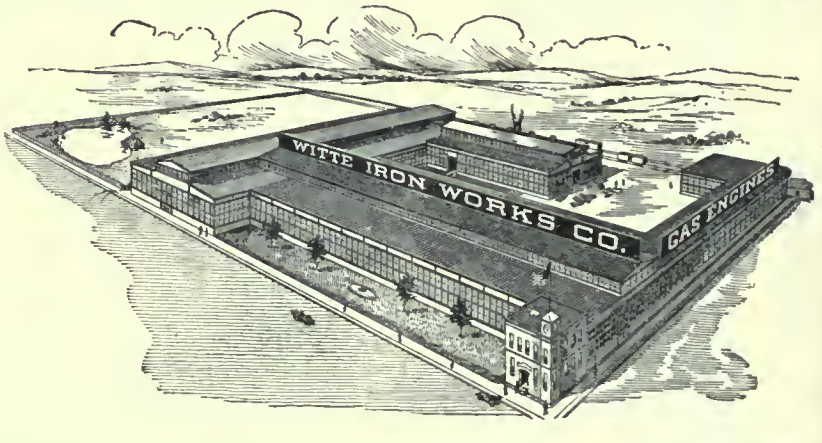
THE PACIFIC TANK CO. and the NATIONAL WOOD PIPE CO. have moved into their permanent offices in the Hanford Bdg., 268 Market St., San Francisco.

THE Ohio Copper Co., Bingham, Utah, controlled by F. A. Heinze, recently placed an order with the UTAH MINING MACHINERY & SUPPLY CO., J. E. Galigher, Mgr., Salt Lake City, Utah, for 288 standard 8-ft. Callow tanks, which are manufactured by the company. This order calls for delivery within four months. The company now has orders aggregating 850 Callow tanks for shipment within the next four months, besides orders for 20 duplex Callow traveling-belt screens.

THE Cleveland-Cliffs Iron Co. has placed an order for a 60-drill Sullivan air-compressor for its new Maas mine at Negaunee, Michigan. The machine will be of the Corliss cross-compound condensing two-stage type, with large receiver intercooler. The steam cylinders will be 24 by 46 in. diam., with 48-in. stroke, and the air cylinders 40 by 24 by 48 in., with a displacement capacity of 4,000 cu. ft. free air per min. at 60 r.p.m., or nearly 5,000 ft. at 70 r.p.m. The compressor will be built at the Chicago works of the SULLIVAN MACHINERY COMPANY.

The Witte Iron Works.

We illustrate herewith the new plant, now under construction, of the Witte Iron Works Co., of Kansas City. When completed, it will be the largest, most complete, and up-to-date gas and gasoline engine manufactory in the West; it is practically fireproof, being of steel, brick, and stone construction. The establishment has 60,000 sq. ft. of floor space, equipped with the finest of modern machine tools, electric power, traveling cranes, private switches, with enclosed loading warerooms. The company has its own natural gas wells and water supply, so that it will operate an independent electric lighting plant and telephone service, with modern accommodations for the benefit of visiting customers and employees. The new plant will extend from 16th and 17th St., and from Oakland Ave. to Eastern avenue. It is situated on the Missouri Pacific and Kansas City Southern railroads. This plant will be used exclusively for the manufacture of stationary, gas, and gasoline engines, traction engines, farm portable engines, electric lighting plants, mine hoisting engines, pumpers and irrigation equipment, in sizes from 2 to 100 horse-power. This company has been manufacturing many of the above line of engines in Kansas City for over 22 years. The increased number of sales in the last few years has over-taxed the capacity of the present plant. The new plant will be enabled to make immediate deliveries from stock and to extend the company's business to foreign countries. It is expected to have the new plant in operation in about 60 days.



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Editorial.

IT IS A YEAR since the earthquake-fire. We celebrate the anniversary by publishing this special number, in which an account is given of the reconstruction of San Francisco, together with other matter appropriate to the occasion.

REINFORCED CONCRETE is the dominant feature in the rebuilding of San Francisco, therefore the article on this subject by Mr. Lewis A. Hicks, himself the engineer and builder of several of the largest structures now in process of erection, has a special value.

WE TAKE special pleasure in publishing the article on mining finance by Mr. J. R. Finlay. It is all that such a contribution to technical literature should be, for it is practical, interesting, and suggestive. The subject is one that invites a broad discussion and we hope to hear from other mining engineers.

PARTICULAR INTEREST will be taken in the article on the re-construction of San Francisco, written by Mr. Charles Derleth, Jr., associate professor of structural engineering in the University of California. He is outspoken in his criticism and judicious in his suggestions, so that his observations have a value that is not wholly local.

SAN FRANCISCO is being fumigated. The process is unpleasant. But it will do good. Civic spirit is being aroused. The structural rehabilitation of the city is emblematic of a new era of municipal reconstruction. A community such as this cannot be fooled all the time nor will it allow itself to be exploited forever by gangs of rascals, masquerading as lawyers and politicians.

THE ILLUMINATION of the ruined City Hall indicates a curious mental obtuseness. Why illuminate the shame of San Francisco? It is a ghastly monument to dirty politics. Some people complain because the ruins are not removed and the City Hall rebuilt. We would like to see it surrounded by an ugly iron fence and preserved for a hundred years as a warning against municipal corruption.

IT IS ESTIMATED that the total loss by the earthquake-fire was $400,000,000, but even this does not include an immense amount of private property in the form of pictures, objects of art, jewelry, and books. The total area burned exceeded 3,000 acres, or 4.7 square miles, containing 520 blocks, and 25,000 buildings, one-half of which were residences. It was the most costly conflagration in human history.

NEWS FROM MEXICO concerning the earthquake is meagre, owing to interruption of telegraphic service, but it indicates serious injury to the towns on

the west coast. We hope that we have heard the worst and that the injury to life and property has been lessened by the fact of the origin of the tremors being at some distance out to sea. As the mining districts are in the mountains and on the high plateau, the earthquake does not seem to have affected them.

WE THOUGHT we had troubles of our own, and we were even so self-conscious as to speak of them on another page, but when we read what had befallen the editor of the *Comet* at Johnson City, Tennessee, it became apparent that we had taken an exaggerated view of our misfortunes. For the gentleman in Tennessee says: "With our foreman at home shot three times, a printer in the Blountville jail half shot, another in the office not worth shooting, the *Comet* is issued under great difficulties this week."

IN REGARD to the wholesale bribery that has disgraced San Francisco, it is significant that most of us would prefer association with the man who gives the bribe rather than the man who accepts it. This is a perverted notion. The man that is bribed is, in most cases, an invertebrate sneak, without principle and without self-respect, not aware of the dishonor attaching to the deed. The man that does the bribing is usually possessed of wealth and education, with a full knowledge of the meaning of the act he perpetrates; he has principles, he has responsibility, he has intelligence. His crime is done with open eyes; his is the greater blame.

THIS CITY has made a pitiful exhibition of municipal corruption and the detection of it has been made as little dignified as possible. The washing of dirty linen has been done with callous effrontery. Even the administration of the law has been turned to a vulgar comedy. And this aspect has been emphasized by the daily papers, with their wearisome pictures of indicted spoilsmen and ineffective comment on the course of events. A corrupt city government could have been rendered impossible if San Francisco had possessed some strong newspapers. Now they howl like a pack of coyotes in the chill hour before the dawn.

CLUBS AND RESTAURANTS used to make San Francisco a haven of comfort to the weary mining man. Of the clubs, the Cosmos escaped the fire, while the Pacific Union, University, Bohemian, and Olympic have excellent temporary quarters in large residences in the western addition. As for restaurants, the city is already in a position to maintain its former reputation, for the Palace, St. Francis, Fairmont, Tait's, and Sevrn are all up to the highest standards. Those who come from the regions where beans and bacon form the staple diet will find San Francisco as delightful as of yore.

OWING TO the fact that several geologists of the United States Geological Survey have resigned, to take more lucrative positions in the service of mining houses dominated by the Guggenheims, Lewisohns, and other representatives of a historic race, it has become a nice question how many capable men can be held in the service of the Government, which pays salaries so much smaller than those of the big corporations. Like professors, and editors even, the geologist at Washington will have to take much of his recompense from the love for his work. And he must be steadfast in his affection for scientific ideals, he must be wary of temptation, for they say on the Survey that

"The Guggenheims will get you
If you dont watch out."

San Francisco.

ON AUGUST 1, 1836, Jacob P. Leese wrote from Yerba Buena to a friend at Monterey, California, saying: "Leigh low and look out sharp for this Place as we are a gowing to do a snorting Buisiness. Do not make yourself uneasy about Buisiness here for all gows on straight." Yerba Buena was the settlement that became San Francisco, and Jacob Leese was the first merchant of what was destined to be a great mercantile community. His optimism, told in this homely language and early reformed spelling, has been often expressed since then in more resplendent phrase; it has passed from words to deeds. The barren sand-hills have been made gracious with verdure; on the wind-swept dunes rise many storied structures, knit with steel and clothed with stone; the shallows of the shore have been gained to traffic, and the waters of the estuary bear the commerce of a continent. Yerba Buena has emerged from its Spanish background and has become the San Francisco of an American California. San Francisco. The name sounds with an exquisitely melancholy cadence to those that have known her in the days of her prosperity, her disaster, and her recovery. Bret Harte named her "the warder of two continents," he called her "serene, indifferent of fate," who drew all things to her, "small or great." Today she guards the portal of the Pacific aud takes it upon her to forbid the entrance of the coolies of Japan, with a spirit and with a manner that are blended of greatness and smallness, dignity and burlesque; in the midst of a reconstruction that challenges the admiration of the civilized world, she sends her indicted mayor, the first violin of a vaudeville, and the last expression of labor unrest, to represent her in an international negotiation at Washington; in the very act of rising gloriously from the effects of a conflagration that enkindled the generosity of the world, she exhibits the scandal of a municipal corruption that makes the smoke of her fire reek like a tannery. Surely, San Francisco epitomizes the greatness and the smallness of our humanity, and if we love her it is with a devotion that sees, beneath the tawdry politics and the strange antics, the warm heart of a great personality. For cities have characteristics that give them an identity. San Francisco wears her heart upon her sleeve, she is the most Bohemian of the new cities of the world, as little self-conscious as conventional, with the artlessness of a spoilt child and the artistic sensibility of a beautiful woman. Proud of her origin as the City of the Argonauts, rich in the promise of her dominion of the Pacific,

headstrong in the insistence of her supposed rights, serene amid the shock of a cosmic unrest, she appeals to the imagination of a poet and to the perception of the artist. We have known San Francisco at her worst, under her mountebank mayor and in the stench of her putrid politics; we have seen her under a catastrophe that looked like the end of the world, and amid a disaster that had no promise of a morrow; she has exhibited civic instability and geologic disquiet; she has faults that are superficial and she has those that go beneath the surface, riving the rock; and yet, despite them, almost because of them

"With all her *faults* we love her still."

Looking Back.

THESE columns have not reflected the troubled conditions under which we have labored during the past twelve months, and our readers have not been wearied with any recital of woes incident to the great disaster that befell San Francisco a year ago. But the present anniversary of that event seems to warrant a description of circumstances, some of which are eloquent of the human nature that makes the whole world kin.

The earthquake occurred at 5:13 on the morning of April 18, 1906. Owing to the bursting of gas mains and the crossing of electric wires, a dozen fires broke out immediately. At 10:30 our offices at 330 Market street were doomed. Those of us who lived on this side of the Bay could do nothing, for the burning city was placed under military control early in the morning and admittance from the suburbs was forbidden. But among our people living in San Francisco itself were two, who, despite the urgency of their own affairs, found a way to our offices and did their utmost to save valuable papers. Fourteen times JOHN J. YOUNG and PHILIP F. SAGE climbed to the top of the six-story building, which had been racked by the earthquake and was surrounded by the encroaching conflagration. A co-tenant in the building, Mr. Charles E. Townsend, had secured a light delivery wagon with the purpose of saving his library and it was promptly arranged that they should help him to remove his books, while he in return was to aid them, giving the use of the vehicle for transporting such material as they rescued. After two hours of unremitting labor, the most valuable records having been secured, this wagon-load was taken to the Central market, in the basement of which it was stored. But it was not long before this building also was threatened; Mr. Townsend secured another vehicle and hurriedly transferred his own material and ours also to a safer place. To make a long story short, he had to move it six times, losing a few things each time, until finally a hole was dug in a vacant lot near the Hollushickie Club, the members of which helped to bury everything under a safe cover of sand, together with the pictures and other valuable possessions of the club. There it remained until the conflagration had spent itself, on the evening of April 20. A week later, the salvage was disinterred and our share of it was brought to Berkeley. In the meanwhile 330 Market St. was an insignificant part of a vast ruin. On the top of the crumbled brick and twisted iron, we found our safe. As soon as it was cool, an examination was made. There was a big hole in one side; it was apparent that the thin iron sheathing had been punctured in falling and the cementing material was mere rubble. All the safes in San Francisco proved a delusion; so much care had been taken to make them burglar-proof that they had ceased to give protection from fire. Hauling it to the water front, we turned a stream of water into the safe, washed out the cinders, and panned them—like miners—securing $55 in currency and a medal. The last had been awarded to the MINING AND SCIENTIFIC PRESS at the Chicago Exposition, it was in an aluminum case, and while the plush had become soot, the metallic case had protected the medal itself, so that it was only slightly oxidized. Of course, all the paper currency and account books in the safe had vanished in smoke—a contribution to that vast column, which like the clouds of steam from an erupting Vesuvius had darkened the sunshine during the days of the conflagration.

As we were among the first to know of our loss, so also we were among the first to make a new start. At noon on April 18 offices were engaged at Berkeley; by 2:30 P. M. on the same day arrangements had been made for printing. The issue of that week had gone to press and had been consumed in San Francisco, so a single sheet was sent out in its place on Friday evening, April 20. In order to ensure transmission in the mail, this sheet was sent by letter postage and a number of women refugees were employed in addressing envelopes. For ten weeks, until an addressing machine arrived from Chicago, all the copies of the paper were addressed by hand. By immediately notifying the postmaster at San Francisco, our mail began to reach us a week after the disaster and it brought the revenue so much needed at a time when all the banks were closed. Our agents were directed by telegraph to secure new plates from the advertisers and in the meanwhile eight pages were reproduced by zinc etching from the issue of April 14. This work was done at Oakland, at Fresno, at Los Angeles, and at Sacramento, each establishment being able to do only a little for us, owing to the general rush of orders from other publications. In order to get good half-tones we sent photographic prints to Chicago. Thus, in one way and another, the issue of April 28 and the succeeding weeks appeared, a few days late, but looking robust. The publication of the paper was hindered by the call for job printing, which was apt to get preference at a time when such work received high payment, and as we had no definite contract with the printers at Berkeley, themselves publishers of an evening paper, we had many hours of anxiety. A new plant for a composing room had been ordered by telegraph, and it began to arrive from Philadelphia in June. As we had decided early in February to reduce the size of the Journal in July, the tinted paper for the cover had been ordered several months previous, and it had arrived at the railroad terminus before the disaster; nevertheless, we did not get that cover-paper until the first week in July, just too late for the first issue in the new size, which therefore appeared with

a white cover. At this time the congestion of railroad traffic was tremendous, the Southern Pacific lines were glutted, at Oakland and Sacramento there were thousands of cars consigned to people that had no warehouses and had postponed unloading. Fourteen thousand cars stood on the tracks and, owing to a lack of system, the identity of them became lost, so that it was months before consignments could be traced and received. At the end of June our composing room was in operation and despite the lack of 'sorts', we managed to do fairly well. In the meanwhile the printers at Berkeley were giving poor service and charging three times the usual price, so that we were uncertain from week to week as to when the journal would be issued. Just in the nick of time a printing establishment was opened in San Francisco, so we bought a motor car to transport the 'forms'; thus we secured better service, although hampered then and up to the present by the delay incidental to the distance—14 miles of land and water—between the composing room and the printer, followed by the further transfer to the bindery and to the post-office.

However, that is all over now. The experience has been enriching. While the fear of the Lord was on them, many people behaved handsomely, but the strain was too great for some of them. In contrast to the personal hospitality and general humanity of the citizens of Oakland and Berkeley, who housed and fed the refugees from San Francisco, there was also an exhibition of greed disgraceful to what is termed civilization. Of the stealing of supplies intended for those in distress, of the official corruption that even the horror of a great catastrophe could not restrain, we have no space to tell. Our own experience was enough. We had dealings with the proprietors of three newspaper printing-plants, two at Berkeley and one at Oakland, and of two of them it can be said that they gave a lurid exposition of the pitiful smallness of man when possessed of the hunger for money; they illustrated the reason why the daily press is so often without influence, because it is controlled by creatures without character. For the rest, the account is more than balanced by the generosity of friends, the loyalty of our staff, and the integrity of many with whom we had business dealings. Our advertisers, almost without exception, paid for the advertising appearing in the issue that was burned and treated us with considerate kindness during the time of trouble. Blake, Moffit & Towne, from whom we get the paper on which the PRESS is printed, supplied us from their best stock and took no advantage of the higher prices ruling after the disaster. We lost all our files, of course, but numerous offers of old copies of the journal were made by subscribers in different localities and within a couple of months we had one complete file, covering 46 years, and several sets extending over periods of ten and twenty years. Our contributors, the leading men of the profession, helped with articles and notes in most encouraging fashion. Of offers of money in sums ranging from $100 to $10,000 it is hardly befitting to speak, except to record expressions of goodwill that were more affecting than even the burden of anxious hours. To the members of our staff the difficulties to be overcome only presented the opportunity for demonstrating the sort of resource and energy that have made the West, and we can say deliberately that the calamity created a solidarity such as years of quiet prosperity could not have evoked. And what holds true of them is true also of our relation to the community in which we live; we have shared the trouble, so too we share the stimulus of the rehabilitation of a great city. Newcomers last April, we are today the pioneers of another era.

The New Smelter.

GOOD progress is being made in the construction of the copper smelter at San Bruno, just south of San Francisco. These works will be an important factor in making San Francisco a metallurgical centre, for the lead smelter at Selby may also be regarded as a part of the City's industry. Copper ore will come here from Shasta and Madera counties, in California, and from Alaska; silicious material from Nevada will give the required mixture; in addition, the Dairy Farm mine in Placer county is relied upon for an assured supply of ore. This property was bought by the Guggenheims from L. C. Trent two years ago, and it has been opened up since then, so that a body of copper-bearing iron pyrite 1,000 feet long and 50 feet wide has been proved to a depth of 500 feet, carrying sufficient value in the precious metals and in copper to make exploitation profitable. The mine is seven miles from Sheridan and ten miles from Lincoln, both stations on the Southern Pacific railroad. A branch line is to be built, and over it will come the supply of ore well adapted to serve as a base for the silicious material of the precious-metal mines tributary to San Francisco. The new smelter at San Bruno is expected to be in operation at the end of the current year. It consists of roasters, blast-furnaces, reverberatories, and converters; the first unit will have a capacity of a thousand tons per day, and it will be doubled or trebled as growth of business warrants it. The product as it comes from the converter will contain 98 per cent copper; for further refining it will be sent to New York, which is the main distributing point for the metal—a fact rendering it economical to pay freight on the small percentage of impurity in the blister copper. Transport by rail costs $14 to $15 per ton, a rate which competes successfully with shipment by sea, not to mention the saving of interest on the value of the copper while in transit. The freight to Denver is the same as to New York, an illustration of the anomalies of railroad transport, due to pooling between railway companies. We regard this smelting enterprise as of great importance in the development of industry on the Bay of San Francisco.

Nor do we fear any injury by reason of smelter fume. The engineers of the smelter company have had ample warning from Salt Lake and elsewhere of the importauce of avoiding such trouble and, in consequence, they are building a stack 305 feet high, the top of which will be 400 feet above the Bay. Dust chambers of unusual size will be a further safeguard. In addition, a sulphuric acid plant will be operated during those months when

the wind blows from the north, and the effect of this will be to entrap the noxious fume and utilize it in the manufacture of acid to be used in making super-phosphate, which, as a fertilizer, will find a ready market in California. As is generally known, the prevailing wind is from the west, and it is only during a few days in the year that the direction of the air currents is such as to carry the smelter smoke where it could do harm, that is, if other precautions were omitted. East of the smelter is the broad expanse of the Bay, with no settlement within fourteen miles, and it is in that direction that the wind will bear the smoke nine months in the year; but southward are the villas of Burlingame and San Mateo, where reside many wealthy people, and it is to protect them from a possible nuisance that all the precautions are being taken. A stitch in time saves nine, and it is in this spirit that the smoke-condensing arrangements have been designed. The result will be that while a large portion of the community is benefited by the establishment of a new industry, the others will have no ground for complaint. On another page we give a sectional elevation of the plant and with it a map of the Bay of San Francisco, indicating the exact locality of the site.

Gold Production of the World.

WE have been able to secure sufficient data to make a reliable estimate of the amount of gold produced in 1906. Of the total only 12 per cent is not based on actual statistics. The output of some of the countries of the world is not yet obtainable from official statements, but these sources of the metal happen to be of minor importance. In the preparation of the tabulated statement that follows, we have taken fine gold at $20.67 per ounce Troy and the pound sterling at $4.85, so that anyone desiring to convert the totals, either into ounces or pounds, can do so.

GOLD PRODUCTION OF THE WORLD.

	1905.		1906.	
North America:				
Canada	$14,610,395		$12,023,932	
United States	88,.80,700		96,101,400	
Mexico	1.,526,855—$117,317,950		15,847,880—$123,973,212	
Africa:				
Transvaal	100,890,058		119,212,937	
Rhodesia	7,180,177		9,821,087	
West Africa	3,172,027—	111,242,262	4,165,180—	133,199,204
Australasia:				
New South Wales	5,669,099		5,249,911	
Victoria	15,448,055		15,963,234	
Queensland	11,951,784		11,098,219	
Tasmania	1,520.072		1,253,615	
Western Australia	40,416,382		37,090,909	
New Zealand	10,193,514—	85,201,906	11,021,389—	81,677,277
Russia		22,291,600		24,000,000
India		11,655,100		10,694,077
British Guiana		1,637,685		1,641,031
Other countries		27,142,697		30,000,000
Total		$376,489,200		$405,184,801

The grand total is $405,000,000, an increase of nearly $30,000,000 over the previous year. It is noteworthy that the gain comes chiefly from Africa, where an increase of $21,000,000 is recorded; and of this, $18,500,000 is to be credited to the Transvaal. In that country the dividends also increased from $23,559,064 in 1905 to $27,816,536 in 1906, the total dividends paid since the South African war amounting to $97,523,650. Next in importance is North America, where there is an aggregate gain of $6,500,000, due wholly to the United States, which ranks easily first with a production of $96,000,000. The increase of $8,000,000 made in the United States is due to Alaska and Nevada, as explained in our issue of January 19. In Canada, the yield from the placers of the Yukon decreased from $8,327,200 to $5,600,000, while in British Columbia the output remained stationary at about $6,000,000. In Nova Scotia and Ontario the mining for gold is insignificant, when viewed in its world-wide aspect. While there is a diminution of $2,500,000 in Canada, Mexico exhibits an increase of $1,000,000, which is less than might have been expected, having regard to the energy with which Anglo-American capital has been applied to the mines of the southern Republic. Fully one half of the total yield comes from three mines in El Oro district. Turning to the antipodes, we find that the output of the States of the Australian Commonwealth and New Zealand shows a diminished figure, being $3,500,000 less than it was in 1905. The chief decline is in the leading State, namely, Western Australia, where $37,000,000 was produced as against $40,500,000 the year before. This is due to the slow exhaustion of some of the big mines, without a compensating growth of the smaller properties. Dividends, however, did not decrease heavily, being $9,661,500, or only $851,548 less than in 1905. The old districts of Victoria did well. In Queensland, the great Mt. Morgan mine continues to be an important factor. In New Zealand, the Waihi helped to make a slight increase, and the mines of the South Island contributed. Russia's yield is not yet definitely known, but it is expected to be slightly more than the year previous, for there has been a notable increase in the interest taken in the gold mines of Siberia, and the interruptions caused by the Japanese war have been overcome. In India there is a decrease of $1,000,000 or 8½ per cent. The gold comes wholly from the Kolar district, in the Mysore, from a group of mines that maintain a steady production. Among the less important gold-producing regions, there is a slight decrease in Japan, an increase in the Central American States, also in Colombia and Peru. On the whole, the dominant feature is the vast output of the mines at Johannesburg, in the Witwatersrand district of the Transvaal, and it is probable that this contribution to the wealth of the world will increase for a few years longer before it begins to reflect the exhaustion of the mines, the resources of which are measurable. In North America there is a tremendous speculative activity in gold mining and a part of this will take productive form, so that, with large tracts of country still awaiting exploration, there is probability of an augmented yield. In Australasia, it will be difficult to balance the steady decline of the West Australian mines, unless new discoveries are made. The Russian output is likely to increase in 1907, while that of India will exhibit no great change, with a tendency to lessen. Other regions are being prospected and from them more gold will be won, with the possibility of important discoveries in South America. Therefore, 1907 ought to surpass 1906. The maximum gold production of the world has not yet been reached.

Personal.

G. D. DELPRAT is at Amsterdam.

CLAUDE T. RICE is now at Butte, Montana.

C. S. HERZIG is returning from Egypt to London.

J. E. SPURR is doing geological work at Leadville.

C. M. ROLKER is on his way to the Lena mine in Siberia.

JUAN FELIX BRANDES is on his way from Mexico to Paris.

JOHN A. PORTER, of Denver, was in San Francisco this week.

BERNARD HUNT has gone to the Gold Coast of West Africa.

ROSS B. HOFFMANN will be at Tonopah for the next few months.

WILBUR E. SANDERS, of Butte, has been on a visit to New York.

F. L. RANSOME, of the Geological Survey, has returned to Washington.

F. LYNWOOD GARRISON has returned to Philadelphia from Santo Domingo.

THOS. B. BASSETT is mine manager for the Belen Mining Co., at Cumpas, Sonora.

F. H. MINARD has been examining mines near Santa Lucia, in Sinaloa, Mexico.

G. W. MILLER is examining mines at Telluride, Colo., in behalf of an English syndicate.

JOHN M. CAMERON is now manager for the Butte Central & Boston Copper Co., at Butte.

GEORGE W. MCBRIDE is the new superintendent of the Sierra de Cobre mines at Cananea.

J. J. YECKEL is manager of the Central property, in the Taviche district, of Oaxaca, Mexico.

ALLAN A. DAVIDSON is on his way from London to Rio Janeiro, to examine mines in Brazil.

H. W. HAZARD is in charge of the Natividad copper mine, near Ocotlan, in Oaxaca, Mexico.

JOSEPH C. HOPPER has resigned from Charles Butters & Co., and has gone to England on a visit.

ARTHUR W. JENKS passed through San Francisco on his way from Montana to Riverside, California.

R. DE SALLIER, chief assistant of R. M. Atwater & Co., is back in Helena, after a business trip to New York.

LLEWELLYN HUMPHREYS has become advisory engineer to Gunn, Thompson & Co., of Salt Lake and New York.

JESSE F. WELLBORN succeeds the late FRANK J. HEARNE, as president of the Colorado Fuel & Iron Co., at Denver.

W. B. DEVEREUX has recovered from a long and serious illness. His sons are now in partnership with him at New York.

SAMUEL STEVENS has gone to Hahns Peak, in his capacity of manager of the Iowa-Hahns Peak Gold Mining Company.

WALTER J. MORRIS has been appointed superintendent of the cyanide plant belonging to the Octave Mining Co., in Arizona.

A. W. GEIGER, lately assistant to the manager of the smelter at Hadley, Alaska, is in San Francisco, on his way to Nevada.

CHARLES P. BOONE, of Berkeley, is leaving for San Sebastian, in Salvador, to take an appointment with Charles Butters & Co.

F. F. SHARPLESS, after doing work of inspection in Colorado, has gone to Oaxaca, Mexico. He will return to New York in June.

HOMER EMERSON, formerly superintendent of the Grey Rock mine at Butte, is now superintendent of the Boston & Corbin property.

R. H. BURROWS is examining mines in Chihuahua, Mexico, in behalf of the Kansas City, Mexico & Orient Railway Company.

L. M. KING is moving his office from Oakland to San Francisco. After May 1 he will be at Second and Minna St., San Francisco.

H. VINCENT WALLACE has returned to Nogales, Ariz., from the examination of mines at Guanajuato and other districts in Mexico.

ALBERT L. GREENE has resigned as chemist at the Deming smelter, and is now manager for the Santa Catarina Co. in Oaxaca, Mexico.

WALTER FITCH has been appointed mine superintendent of the Calumet & Hecla, JAMES MACNAUGHTON being, as heretofore, the general manager.

JAMES CHYNOWETH has resigned as superintendent of the Centennial and Allouez mines, in Michigan, and has gone to Globe, Arizona, to supervise work at the Superior & Boston Co.'s mines.

Obituary.

JOHN A. KEBLER, general manager of the coal operating department of the Colorado Fuel & Iron Co., died suddenly, at Trinidad, on April 12. His death was due to ptomaine poisoning, caused by eating canned salmon.

BENJAMIN SADTLER, a mining engineer well known in the West, dropped dead on a street at El Paso, Texas, on March 29, while on his way to Mexico from Denver. He was an accomplished man and for six years held the professorship of mining in the Colorado School of Mines.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco, April 17.

Argonaut	$4.80	Central Eureka	$0.97
Con. Virginia	1.07	Savage	1.00
Mexican	0.99	Sierra Nevada	0.61
Ophir	2.45	Yellow Jacket	1.10
Belmont	4.45	Midway	1.55
Combination Fraction	4.65	Montana	3.60
Goldfield Con	7.93	Mohawk	.....
Jim Butler	1.24	Nevada Hills	4.55
Jumbo	3.80	Red Top	4.00
Jumping Jack	0.16	Sandstorm	0.72
Manhattan Con	0.75	Silver Pick	1 21
Manhattan Dexter	0.22	Tonopah Ex	3.85

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
April 12	23⅞	6	6⅞	65⅛
" 13	23⅞	6	6⅞	65⅞
" 14	Sunday.	No market.		
" 15	23⅞	6	6⅞	66
" 16	24⅛	6	6⅞	65¼
" 17	24⅛	6	6⅞	65⅜
" 18	24⅛	6	6⅞	65⅛

ANGLO-AMERICAN SHARES.
Cabled from London.

	April 11.	April 18.
	£ s. d.	£ s. d.
Camp Bird	1 4 6	1 3 9
El Oro	1 7 6	1 6 9
Esperanza	2 1 3	2 3 0
Dolores	1 11 3	1 12 0
Oroville Dredging	0 18 0 ex div.	0 17 6
Stratton's Independence	0 3 6	0 3 6
Tomboy	2 0 0	1 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices April 4.	April 18.
Bingham Central	1⅝	1½
Boston Copper	25¾	27⅜
Calumet & Arizona	163	157
Cumberland Ely	9½	8¾
Dolores	8	8
El Rayo	5⅛	5⅜
Guanajuato Con	4⅛	4
Giroux Con	8½	9⅛
Greene Con	24½	24½
Nevada Con	14¼	13⅜
Nipissing	13½	13
Tennessee Copper	40	40½
Tonopah Ex	3½	4
Tonopah-Belmont	4¾	4¾
Tonopah	15½	18
United Copper	59½	60¾
Utah Copper	30¼	28⅝

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

Mining Summary.

ALASKA.

(Special Correspondence).—The Copper River & Northwestern railway is under construction from the tidewater terminal at Katalla, Alaska, through the Copper River valley, to the interior of Alaska, about 500 miles of railway line. A breakwater about one mile long will be constructed at Katalla. This road is one of the J. P. Morgan and Guggenhelm interests in Alaska, and will be built by the Katalla company, of which H. K. Rogers of Seattle is the president and general manager, and John Krey is the chief engineer. Contracts for the whole or any part of the work will be let immediately.

Seattle, April 13.

JUNEAU.

The strike situation at the Treadwell mines remains unchanged, and the United States troops from Fort Seward are close at hand and, if any trouble should arise, will be called out to protect the property of the company. The strike is general and there are barely enough men left to run the pumps.

The town of Douglas feels the effects of the strike keenly, as on account of the merchants siding with the operators, the miners are buying their supplies in Juneau, and many miners and their families are moving away. The charter for the Douglas Union of the Western Federation of Miners has arrived and the Union is determined not to recede from its demands.——The Rubicon Gold Mining Co. has sent a representative to the States to purchase a compressor and other mining machinery, for early shipment.

The latest report, though meagre, states that the strike has been ended at the Treadwell, with a victory for the operators, who will retain their black-list.

ARIZONA.

COCHISE COUNTY.

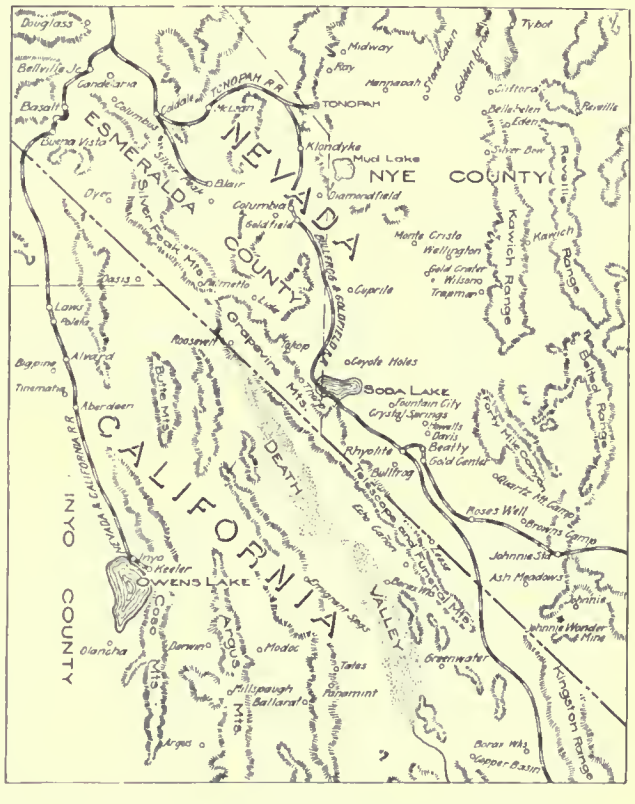
The leaders of the Labor Union in Bisbee have finally succeeded in precipitating trouble. At a recent meeting, attended by about 70 members, it was decided to appoint a committee to call upon the men at the head of the mining companies operating in the Warren district, and demand recognition of the Union. The operators refused to discuss the question, stating that Bisbee was an open camp, and there was no recognized union there. The next development was a circular, issued by the Union, calling upon the employees of the local companies to stop work at once. This circular contained no mention of any grievance, except that the mine owners had denied recognition to the labor organization. Following this action, there was a meeting of the mechanics employed by the various companies, at which it was unanimously voted not to stop work in sympathy with the striking miners. This includes machinists, engineers, pumpmen, and blacksmiths, and the resolutions adopted by the meeting prove that they are not in sympathy with this move on the part of the Western Federation of Miners, and as there are 130 mechanics, their action will bear weight.

In the two days following the call for a strike, 564 men drew their time, being divided among the different companies as follows: Copper Queen, 328; C. & A., 92; S. & P., 80; Shattuck, 44, and Denn-Arizona, 20 men. This is about 10% of the men employed in the district, but in addition to these, many men are laying off, awaiting developments, so that the total number involved is probably about 1,100 men, or one-quarter of the total force working in the district.——The reports of the Calumet & Arizona, and the Superior & Pittsburg mining companies for the year 1906, have been issued.

During the year the C. & A. produced 18,735, and the S. & P. 4,522 tons of copper. At the S. & P., 40,018 ft. of development work has been done during the year. The Cole shaft has opened oxidized ore at the 1,100-ft. level, on the Jessie Glencairn claim, and at the 1,000-ft. level on the Sunnyside claim, while on the Irish Mag claim of the C. & A. as much ore has been developed as has been stoped.

YAVAPAI COUNTY.

A Phœnix syndicate, associated with I. T. Hosey, has secured control of the Neiman and Crosby groups of claims in the Santa Maria district.——The Arizona Chief company is now in control of the group of claims formerly owned by G. C. Davis, in the Eureka district. A 50-ton Lane mill will probably be installed, and a pumping plant built on Burro creek.——In the Jerome camp it is expected that at least three new producers will develop this year. The Jerome Mines Development Co. continues to get encouraging results from its diamond-drill work.——The Arkansas & Arizona shaft is below the 200-ft. point, and proceeding rapidly, with the machine drills now in use.——A new hoist has been erected at the United Verde Extension.——The Jerome Verde company will put on a large force of men at once.——The shaft of the Verde Grande Copper Co. is down 80 ft. and the new hoist is being installed.——In the camps near the Humboldt smelter much activity prevails. The Iron King, McCabe, and Gladstone properties are daily shippers.——The force has been increased at the Oriental.——The 20-stamp mill is running at the Poland mine, although the developments in the tunnel were disappointing.——The Blue Bell and De Sota ship daily to the smelter.——



Map of the New Mining Districts of Nevada and California.

Two mills, the Tiger Gold and Lincoln, are running in the Crown King vicinity, and work is being pushed on the California-Benton, Peck, Gold King, Castle Rock, and Gazelle properties.——On the west side of the Bradshaw Mtn., the Big O'Brien mill is nearly completed; a mill is being built at the Black Rock; and the Monarch M. & M. Co.'s new mill is running satisfactorily.

CALIFORNIA.

AMADOR COUNTY.

The Lucas mine, on the Mokelumne river near Big Bar bridge, has been closed and all the men paid and discharged.——The Bunker Hill mill ran 20 days last month and produced $11,000. Four dividends have been paid since the beginning of the year.

CALAVERAS COUNTY.

The miners of the Penn chemical works near Campo Seco have struck. The men have been working 10 hours for $2.75, and the 120 men at the smelter also work under these conditions of long hours and small pay. This is one of the richest copper prospects in the State.

EL DORADO COUNTY.

The Eureka slate quarry company has been awarded the contract to furnish 40 cars of roofing slate for the Government building at Cheyenne, Wyoming. The company is also making regular shipments of slate to San Francisco. Improvements will be made at the quarry this summer, the principal one of which will be the extension of the cable tramway, which will have a total length of over four miles. W. J. Dingee is the owner, and Charles H. Dunton, the manager of the property.——The shaft of the Alpine mine, in the Garden Valley district, is flooded from the 300 to the 200-ft. level.——The mill at the Union mine is closed, owing to the excessive flow of water into the underground workings.——A force of men is re-timbering the lower tunnel of the Standard Unit mine.——The new compressor-building at the Sherman mine has been completed and the 100-h.p. compressor will be installed at once.——Engineers have just completed the examination of the Big Cañon and Forest Hill mines, in the Shingle Springs district, and their client, J. B. Menardi, may purchase the properties.

HUMBOLDT COUNTY.

(Special Correspondence).—H. DeC. Richards, manager of the Orleans Gold Bar Mining Co., has been at Orleans. This company is arranging to put the lower flat into the river with as great speed as possible, all the Camp creek water having been carried to the east side of the property under a head of 400 ft. at bedrock, with an open chute of 200-ft. head from ditch to penstock. Thus the company will have a good piping-head on about 600 acres of its best ground, without any further work.——The suit regarding Camp creek rights is still awaiting the decision of the Supreme Court; meanwhile, the company is mining on both sides of the property.

Orleans, April 9.

INYO COUNTY.

(Special Correspondence).—The discovery of an immense body of colemanite is reported, on the west side of Death Valley. The deposit is over 50 ft. wide in places and will yield about 20% borasic acid. The discovery was made by Clarence Neyman, an old pioneer of the district.

Greenwater, April 8.

NEVADA COUNTY.

The Black Bear mine on Deer creek, a few miles northwest of Grass Valley, is to be worked again, and the scheme is being financed by Sacramento men. This property has produced some good ore, and the shaft is reported to be in milling ore at the bottom.——There is a good showing in the No. 6 tunnel of the South Yuba M. Co.'s property, which is being driven to cut the copper lode which was exposed in some workings higher up the hill.——The Wide West claim, adjoining the Canada Hill on the east, has been bonded by J. T. Morgan to Crocker & Co., of Tonopah. The shaft is down 100 ft. and sinking will begin at once. ——The two-stamp mill at the Ironclad mine will be replaced by a 10-stamp mill, and a pipe-line will be laid and a 1,400-ft. ditch dug. Eastern shareholders have financed the undertaking.

The Belle Union mine, situated in the heart of the Grass Valley mining district, on the east bank of Wolf creek, will be worked again. This property adjoins the Norambagua, which was recently sold to Pittsburg capitalists. A corporation has been formed to handle the property, and work will be started at once.

TUOLUMNE COUNTY.

(Special Correspondence).—The rich orebody recently uncovered on the 1,100 level of the App mine has been cut into for 20 ft. and there is yet no indication of the opposite wall. The old Heslep workings, which were full of water, were successfully tapped a few days ago, and the water is gradually running out.——The Standard M. Co. is increasing activity at its group of mines, situated southeast of Tuolumne. Development work is proceeding at the Hardtack claim, with Wm. Scott as foreman, and last week a rich strike was made in the south adit. The vein is only 10 in. wide at this place, but is very rich. The mill will be started in about six weeks.——A new 5-stamp mill has been purchased from the Joshua Hendy Iron Works for the Ellen Winton mine and is expected to arrive within two weeks. ——It is reported that at the bottom of the Shawmut mine, 2,300 ft. deep, the vein is 20 ft. wide and assays from $15 to $85 per ton.——The shaft of the Clio, at Jacksonville, will be deepened as soon as the water has been pumped out.—— The pay of employees of the Providence mine has been increased 25c. per day, miners now receiving $3.25; timbermen, $3.75, and muckers and surface men, $2.75.——T. J. Brown, representing Nevada capitalists, has bonded the Sargent ranch, near Groveland, and will soon have a crew doing development work on mineral-bearing veins. The price to be paid for the property is $9,000.——Work is to be immediately resumed at the Kanaka mine, in the Groveland section. Geo. DeSallier will be superintendent.——The erection of a 10-stamp mill on the Garfield mine, situated near the Grizzly, will be commenced soon, the machinery and lumber now being hauled to the property.——The North Star mine, in which a large flow of water was encountered a few weeks ago, with the result that operations had to be temporarily stopped, is unwatered and development is again in progress.——It has recently been learned that the limestone in the vicinity of Springfield and Columbia contains gold. Assays have been made and the average showing was $2.90 gold and 10c. silver per ton.——Johnson Lane, formerly superintendent of the App mine, lately became foreman of the Confidence.——Active operations have been commenced at the Dondero placer mine, above Columbia, by the new owners.

Tuolumne, April 14.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—Based on the figures for the first three months, there is every reason to believe that the producing mines in the Cœur d'Alene will pay in dividends more than $7,000,000 in 1907. Seven companies disbursed $1,598,500 from January 1 to March 30, as follows: Federal M. & S. Co., $510,000; Bunker Hill & Sullivan, $540,000; Hercules, $228,000; Snowstorm, $140,000; Hecla, $100,000; Success, $20,000; Monitor, $9,500. The Snowstorm and Monitor are copper mines, the Success produces lead and zinc, while the others are lead-silver propositions. Several other mines are to enter the dividend-paying class, among them being the Black-Cloud-California, operated by the Pittsburg Lead Co., which, it is reported, earned $40,000 in March. Another is the Stewart, which is in ore. The Charles Dickens, which has just installed a compressor, should also join the ranks in the near future.—— Strikes of good ore are reported from various mines in the district. The latest is the Gold Hunter, near Mullan, where, it is said, an ore-shoot was encountered in the lower tunnel, 3,000 ft. from the portal. The mine was one of the earliest producers in the Cœur d'Alene, and has paid big dividends. The ore is richer in silver than in other large producing mines of the district. During the last three or four years it has been worked intermittently. The concentrator did not make a good saving, so it was altered, improved machinery being installed 18 months ago. The new mill gave satisfaction, but the company has been much hampered during the summer and fall by lack of water. The strike will mean much to the Mullan district, which is working more miners than any other portion of the Cœur d'Alene. The mine is owned by Chicago capitalists, and is run by Spokane electric power.—— Reports are persistent that the Hypotheek mine, near Kingston, is to be sold. The property consists of seven claims, and some work has been done. Ore has been uncovered in the lower workings, but no shipments have been made. In the drift run from the bottom of the winze two narrow ore-shoots were opened; one was 18 in. wide and 20 ft. long, while the other was eight inches wide. This was at a depth of more than 400 ft. below the apex. Ore has been disclosed in other levels. —— Accidental discovery of ore in an abandoned mine has just been made by F. J. Martin, near Osburn, on the property of the Rhode Island Mining Co. The mine had an excellent surface showing, and the vein was encountered 300 ft. from the mouth of the tunnel. Shortly after this the property was abandoned, and nothing but the necessary work has been done on it since.—— James F. McCarthy,

manager of the Hecla mine, announces that the output of the property up to Jan. 30, 1907, was $4,500,000. The mine produced $1,354,000 in 1906, the aggregate value of 16,692 tons of concentrate and shipping ore. The company is installing a new hoist, the vertical depth of which will be 2,500 ft. It will be operated by electricity.—— Reports are that the Hercules mine, at Burke, has tapped a rich orebody in No. 4 tunnel. This is the lowest tunnel, and was started a year ago. It has now been driven 2,000 ft., and it is necessary to proceed 2,000 ft. more before the main lode is encountered. The strike was unexpected.

Spokane, April 12.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—Development is progressing on the main lode of the Nevada Hills property, and the operating force has been increased. The ore continues high-grade and large quantities are being taken out.——A shaft 4 by 7 ft. is being sunk on the Fairview Clipper and has encountered a vein carrying gold and silver, and running $25 per ton. The shaft will be sunk to a depth of 100 ft. before any cross-cutting is done. E. Murphy is the superintendent.——On the Ida group development is still progressing and samples of the ore assay well. The main tunnel is 25 ft. from the vein, for which it is driving. Shaft No. 2 is down 40 ft. in good ore, and when the 75-ft. level is reached, a cross-cut will be run to the vein. Shaft No. 3 is down 12 feet.——Shipping ore is being sacked at the Dromedary Hump mine, and new territory opened up. The new shaft is being rapidly sunk, although the non-arrival of the new hoist has hindered proceedings. This property is, after the Nevada Hills, the foremost in the district, and is employing a large force of men.——The Fairview M. & L. Co. is sinking a shaft on the Golden West property. The shaft is down 18 ft., and some fair-grade ore has been encountered.——The main shaft on the Empire State holdings is down 26 ft., and will be sunk to a depth of 66 ft., from which point a cross-cut will be run to the lode. The tunnel is in 150 ft., and has uncovered a promising vein.——Some good ore has been uncovered in the Hot Onion shaft and the management is greatly encouraged. The mine is still a prospect, but development is being vigorously pushed.——Several men are engaged in sinking the shaft on the Fairview Reliance property, and some excellent quartz has been encountered, samples running high.

Fairview, April 11.

WHITE PINE COUNTY.

The new stock exchange has opened in Ely.——A $10,000 payment has been made to F. S. Pheby on the Velvet group of claims purchased by Harry Darlington for the Manhattan Ely Copper Co.——The shaft of the Nevada Con. Stock Co. at Cherry Creek is down 60 ft. and will be continued to the 250-ft. point. J. W. Walker is the manager.——The Nevada-Walkover company has acquired a group of ten claims six miles west of Cherry Creek. A hoist will be installed.——A good body of ore has been struck at the 300-ft. point in the Mary Ann tunnel at Cherry Creek. P. H. Cannon is in charge.

BRITISH COLUMBIA.

The following is the tonnage of ore produced by the Rossland mines for the week ending April 6: Centre Star, 1,930; Le Roi, 2,695; Le Roi No. 2, 490; White Bear, 70 tons. Total for the week, 5,185. The new 650-h.p. electric motor of the Centre Star was started, and will be run for a week without a load, and then will be hitched on to the compressor that is now being run by steam. The motor from the War Eagle is being installed and will act as a helper to the larger motor that has just been started. The shaft has reached a point 70 ft. below the 14th level, and is being pushed toward the 1,500-ft. point. Development continues on the Idaho, and some ore is being mined from the glory hole.——At Le Roi, the hoist is in place on the Spitzee, and the mine is unwatered and will be cleaned out, and machine drills will be put in operation. In the main shaft of Le Roi, a station and pocket are being cut at the 1,650-ft. level, and a drift will be driven to connect with the winze workings.

At the Trail plant of the Consolidated M. & S. Co., 5,518 tons of ore were received during the week ending April 6. In addition to the ore sent from the Rossland mines, the following contributed shipments: Snowshoe, Phœnix, 728; St. Eugene, Moyie, 267; Lone Bachelor, 11; La Plata, Kokanee, 101; Iron Mask, Kamloops, 29; Beatrice, 28; Riverside, 24; and Ottawa, 21 tons of ore.——The Northport smelter is running regularly on ore from Le Roi mine.

The shipments from the Boundary mines during the same week were: To Granby smelter, from Granby mines, 18,879 tons; from Emma, 280. To British Columbia Copper Co.'s smelter, from the Mother Lode, 2,200; from Snowshoe, 520; from Emma, 340; from Morrison, 30 tons of ore. To the Dominion Copper Co.'s smelter, from the Brooklyn, 1,600; from Rawhide, 1,620; from Sunset, 800; and from Mtn. Rose, 105 tons of ore. To the Trail smelter, from Snowshoe, 1,030; from Providence, 30; from Elkhorn, 20 tons. To the Nelson smelter from the Emma, 40 tons. Total shipments for the week, 26,017 tons. In comparing the shipments and smelter receipts in southeastern British Columbia, the following table of shipments by districts is useful: Shipments from east of the Columbia river, 2,101 tons; Rossland, 5,185; Boundary, 27,134. Total for the week, 34,769 tons of ore.

The smelter receipts for the week ending April 6 were as follows: Grand Forks, 19,159; Greenwood, 3,090; Boundary Falls, 4,125; Nelson, 183; Trail, 5,518; Northport, 1,087; Marysville, 600 tons of ore. Total for the week, 33,762 tons.

It is reported from Boston that the Dominion Copper Co. will soon retire $175,000 of its outstanding issue of 6% bonds. The total issue was $1,000,000, but as the company now has available in its treasury about $700,000, a dividend will probably be declared as soon as the addition to the smelting plant is finished. With this new capacity, the company should be able to produce 6,000,000 lb. of copper per year, at a cost not exceeding nine cents per pound.——The Elkhorn mine is again on the shipping list, sending a carload of rich silver ore to the Trail smelter.——The cross-cut from the bottom of the 200-ft. shaft of the Grayhound mine, at Deadwood, is in about 80 ft. and is nearing the vein.——A carload of new machinery has arrived at the Snowshoe mine, including two small motors that will be used until the 400-h.p. motor is installed.

MEXICO.

CHIHUAHUA.

The Porvenir Mining Co. reports satisfactory progress on the Porvenir and Dudosa properties. On the former, there are two shafts, 200 and 100 ft. deep, and on the latter, a 115 and an 80-ft. shaft. N. P. Wilson is the manager.——The aerial tramway, and the railroad to connect it with the M. C. railroad, being built by the San Toy Mining Co., of Santa Eulalia, will be running by May 1. The tram from the mines to the foot of the mountain will be four and one-half miles long, with steel supporting towers. This company will soon begin the construction of another tramway a mile long, from the Galeana mine to the Central mine. J. P. Hutchinson is general manager for the company, and C. H. Wickham is construction engineer.——The Lewisohns, who recently purchased the Parcionera mine at Santa Eulalia, have not sent a new manager, and Charles Qualey is still in charge.——The famous old Rosario silver and gold mine at Guadalupe y Calvo is under option to a London company, which is unwatering the mine. For five years that property has been under option to Charles Clark. The Independence M. & M. Co., which has been operating in the Guachinango district of this State for several years, has been reorganized under the name of the Maseota Copper Co. The promoters are Minnesota men.——The furnace of the Lawson-Page interests, at El Moral, is treating 15 tons of cinnabar ore per day, and regular shipments of quicksilver are made to Ameca. This company's custom reduction plant on the San Gerónimo hacienda in the Maseota district will be operating within two months.——W. M. Matthews of Ezatlán, has started the development of the Palos Verdes group of 21 claims on the Santiago river near the Valenciana crossing. The property was formerly worked by Mexicans.

COAHUILA.

A company has been formed, with a capitalization of $1,000,000, to exploit the coal deposits on the Hacienda de San Blas in this State.

Special Correspondence.

Denver, Colorado.

Treatment Rates at Cripple Creek.—Competition is Useful.—Pot Roasting.—Zinc Ores at Rico.—Drainage Adit Specifications.

The commencement of operations by the Golden Cycle mill at Colorado City has caused a readjustment of treatment charges in the Cripple Creek district. The decrease made by the Golden Cycle management was met by a further reduction on the part of the American Smelting & Refining Co., so that the latter's charges remain lower than its competitors. The decrease in the output of ore from the lower levels of the mines at Cripple Creek, due to the present trouble with water, and the opening of more than one mill to treat the oxidized ore, is undoubtedly the cause of the shut-down of the Union mill at Florence. The United States Refining & Reduction Co. is diverting all its ore to the Standard mill at Colorado City, and whether the supply will increase enough to cause the speedy re-opening of the Union mill is a matter of some doubt. The Homestake mill, at Cripple Creek, after a month's run, announces that it has met with unqualified success, and has operated at a profit on ores of a grade slightly lower than $3. The other mills, now in process of construction, which are designed to treat oxidized ore, stimulated by this announcement, are hastening their preparations, and will soon be in readiness to begin work. In regard to poor sulphide ores, it is impossible to send them to points where coal is cheap, because of the freight charges. Similarly, it is not practicable to bring coal for roasting purposes to mills built near the mines, because of the high cost.

It is announced that the American Smelting & Refining Co. has introduced the Huntington-Heberlein process into all its Colorado plants. This process consists in first subjecting the ore to a partial roast in Godfrey, or similar furnaces, mixing with a proper quantity of lime, and then completing the de-sulphurization by blowing air through the mixture in hemispherical pots, known as converters. As modified by this company, instead of using the lime, raw Cripple Creek ore is used to mix with the partially roasted ore, with as good success as in the former method. The sulphur in the ores is reduced from about 40% to 6 or 7%. But by omitting the use of the lime, the essential feature of the Huntington-Heberlein process, namely, the action of the lime as a de-sulphurizer is eliminated, and the process becomes practically a kiln-roast conducted in the apparatus devised for the Huntington-Heberlein process. The next step to be logically taken would be the elimination of the preliminary roast, as in the Savelsberg process. The process as so modified would differ little in principle from pyrite smelting, but in this case the heat developed by the oxidation of the sulphur is only sufficient to sinter the mass, and not to fuse the charge. Naturally, the reactions that take place on fusing do not appear in the converting process. These reactions are brought about by the subsequent fusion in the blast-furnace. Such a process might then be regarded as pyrite smelting in two stages, thus securing the lower temperature throughout necessary to prevent excessive loss of lead.

The construction of a concentrating mill and smelter to treat the low-grade zinc-lead ores of the Rico district is to be started in the near future. While the details of the milling process to be followed are not yet known, it is said that it is similar to the one now in operation at Broken Hill, Australia.

The specification for the new drainage adit at Cripple Creek have been made public, though bids have not yet been advertised. The specifications provide for an adit 7 by 10 ft. in the clear, which must be driven at the rate of at least 300 ft. per month, all necessary timbering is to be done by the company, and the machinery is also furnished, the contractor supplying power, labor, and supplies. Employers' liability insurance is to be carried by the company, the contractor to pay the premium on this, and also furnish a bond for $20,000 to cover possible debts and liens.

Salt Lake, Utah.

Consolidation of Companies.—Dividends.—Labor Troubles at Park City.—Silver King Merger.—New Mills at Bingham.

Shareholders of the Star Consolidated Mining Co. have been called to meet in special session on May 8 to discuss the matter of effecting a coalition with the Black Jack Mining Co., both operating in the Tintic district. It is proposed that the latter shall absorb the Star Consolidated giving its shareholders one-half of the capital stock of the reorganized Black Jack Co. The present capitalization of the latter is 300,000 shares; but it is to be increased to 1,000,000 shares.——The May Day mine at Tintic has been closed down temporarily. It is said that the new management is dissatisfied with the conditions of the smelter contract under which the former management operated. There are rumors of consolidation with the Uncle Sam; this company has made a shipment of ore from the body opened recently on the 800-ft. level, the controls returning 36% lead, 12 oz. silver, and $1.50 in gold. Thirty-two tons netted $1,027.

Dividends have been declared this month by the Beck Tunnel Con. Mining Co., for $40,000; Grand Central, $25,000; Bullion Beck, $10,000; Utah, $3,000. The Ontario and Daly-West mines at Park City were closed temporarily last week on account of slight labor difficulties, but these were adjusted without serious loss to either employer or employee. The matter of the time of going on and off shift entered into the controversy. The differences with the men employed in clearing the Ontario drain adit, however, have not been settled. The completion of the deal for a coalition of the Silver King and several adjoining properties under the name of the Silver King Amalgamated Mines Co. is expected at any moment. The Odin mine is likely to be included in the merger.

The Phœnix vein has been cut at a distance of 1,200 ft. from the portal of the lower adit in the Phœnix mine, at Bingham. A large tonnage of high-grade lead ore was extracted from this vein in the adit 200 ft. above. A small mill is operated on the property.——The addition recently made to the mill of the New England Gold & Copper Co. is being used and the plant is now operating at double its former capacity. The management expects to turn out at least 14 cars of concentrate monthly with present facilities and, in addition, market from three to five cars of crude lead ore. Two cars of copper ore were sold last week.——The new mill of the Markham Gulch Milling Co. is nearing completion. It will be in operation by May 1 and will treat ores of the Utah Apex and Utah Development mines.

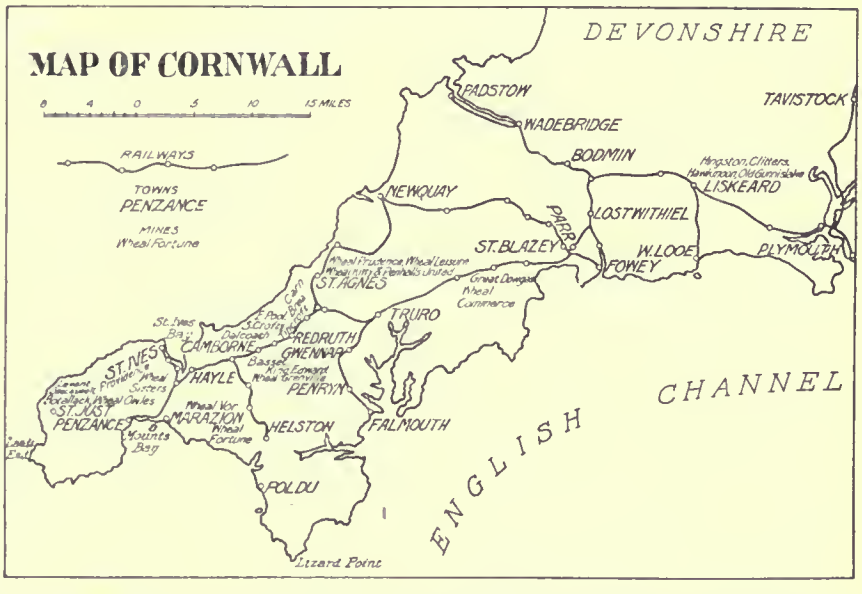
Development work has been resumed in the Scottish Chief mine near Alta.——The Ophir mine at Stateline will be started up about May 1. The property has been shut down for several years and is equipped with an expensive mill, which was not suited to the ore.——Through traffic has been resumed on the San Pedro, Los Angeles & Salt Lake Railroad. The construction of the Caliente & Pioche branch of the road will be started, it is said, within one week or ten

days.——The ore and bullion settlements reported last week through Salt Lake banks amounted to $485,000.

London.

The Share Market.—Big Pumping Engines.—Deep Mining in Cornwall.—Successful Development.—Mining in Siberia.—Banket in West Africa.—Egyptian Gold Mines.—Stratton's Independence.—Treatment of the Big Dump.

In reviewing the mining account just concluded, a City report states that usually small and irregular, but chiefly downward, changes are shown in the list of shares. So far as mining securities are concerned, the account has been productive of little fresh business, apart from the leading diamond and copper descriptions (which have been lively enough at times); but that it is explained partly by the fact that barely ten working days have elapsed between the two carry-overs, and partly by the general market demoralization, which has had the effect of increasing the public indisposition to enter into commitments, more especially with the Easter holidays looming ahead. The dealings in the principal copper and diamond shares, which have provided the mining department with its outstanding features for months on end, were largely on account of continental operators, mainly French, and both in Paris and Berlin liquidation upon a substantial scale has latety been in progress, with unsettlement and depreciation as consequences. In view of the general market conditions, Kaffirs may be said to have held their ground remarkably well. They have been assisted by the excellent results reported for February, by the several discoveries in the east-central portion of the Rand, aud by the steadily growing impression that the industry Is going to be fairly treated by the new Transvaal legislature.



The starting of two pumping engines during the month is a welcome sign of the renewed activity in Cornish mining. The christening of a powerful 80-in. engine at Condurrow United was an event of importance even in a district which can boast of containing the leading mines of the present day in Cornwall. This engine, although built for West Chiverton in 1886 was found to be little worn when it was again transferred a few months ago from Gwennap United to Condurrow. Mr. Peter Watson, who presided at the luncheon which followed the christening ceremony, said he had known the great Condurrow mines intimately for over half a century, and the great thing he had always borne in mind was the fact that the sett was situated in the centre of a series of successful mines. To the north was Dolcoath, which was always to the fore and really still looked like a property in its infancy. Then Basset mines lay to the east and from those mines enormous quantities of tin and copper had been raised. Southward lay Grenville, which had now been placed upon a satisfactory financial basis and started upon a career of prosperity. Grenville was still in its infancy and had great possibilities for the production of mineral. Condurrow mines were in the centre of a rich district, and if there was one sett more certain to be rich and prosperous than another, it was the sett upon which they were standing. When Condurrow worked last it was equipped with an engine of 36-in. cylinder and that sufficed to pump water from the 300-fm. level. But the present proprietors had determined to install an engine of sufficient size to undertake even greater duty. With such an engine installed the company need have no anxieties as to the future. Mr. Angwin, the engineer, said the engine was one of the finest in Cornwall and would lift 110 tons of water per hour. Mr. John Tonkin and Prof. Laws, of the Camborne School of Mines, gave it as their opinion that taking every factor of cost and duty into account this Cornish engine has advantages over the electric pumps in use in England and France, for the work to be done at Condurrow; an opinion shared by Mr. Negus, the former superintendent, as the result of visits to the North of England and Welsh mining districts. This opinion appears also to be shared by the consulting engineer of the Basset Mines, who is reported as stating that he had gone into the question as regards Basset and found that electric pumping at that mine would cost about £9,000 per annum at least more than the present cost.

The Dolcoath executive has been taken to task for the delay in the sinking of Williams shaft, which was one of the main purposes for which working capital was subscribed by the public when the prospectus of the limited company was issued in 1895. It is thought probable that pressure may be brought to bear on the directors by the new landlords for the resumption of this important part of the development program. There has been a rise in the shares of East Pool on the discovery of a fine lode of tin at the 290-fm. level. In character and size it is said to be the best bunch of tin revealed in this property for a very long period; and as it is in the bottom its importance cannot be too highly estimated. The importance of deep mining is further exemplified at Grenville; in the bottom of Fortesque's a good lode has been cut, and it is larger and richer than the lode in the upper level. In the shallower levels of Grenville there are some rich deposits of copper. The Cornish Consols are operating at South Phœnix, a celebrated mid-Cornwall property, and it is announced that by reason of its favorable geographical position Phœnix has been selected as the future testing ground for all new mining machinery and plant with which the group of pioneer companies purpose to deal. The water has been pumped below the 150-fm. level of the Hingston section of Clitters United and here again the bottom part is the richest. The secretary states that "the exploratory work so far done shows this level to be decidedly better than we have previously unwatered, both for tin, wolfram, and copper values."

Siberian stocks of all kinds are dull on the market just now and reports from the mines are of a meagre description. The manager of Orsk Goldfields reports that for

the four weeks ended February 23, the total output of retorted gold was 1,067 oz. from 2,664 tons of ore. Of this amount 760 oz. were obtained by crushing 1,393 tons of tributer's ore, 25 oz. were obtained from the Suvunduk and Siberia alluvial claims, and the balance, 282 oz., from crushing 1,271 tons of the ore that was purchased from the lessors of the property. The total revenue to the company from all sources for the period in question, after deducting the working expenses of the mills, is estimated at £1,861. Owing to the continued severity of the weather, it is anticipated that the water supply will be insufficient to enable more than four of the Chilean mills to be worked until the thaw sets in.

Among West Africans the 'banket' descriptions, which have remained steady throughout the long period of market inactivity, are said to have begun to attract attention again. The reason for this is to be found in pending developments at the mines. The Abosso mine, with 30 stamps, has been producing gold to the value of over £150,000 per annum for a working profit of nearly £60,000, but the annual production will apparently soon reach a quarter of a million sterling, as the 20 additional stamps, which it has just been decided to erect, are expected to be shipped shortly and to be in full swing by the end of June next.

Regarding Egyptian gold mining a correspondent asks: Does the Egyptian section of the mining market really exist? That it did so at one time is well known, but that unexercised option of J. B. Robinson on Nile Valleys seems to have been the beginning of the end. There is a scarcity of news from Egypt with reference to those gold mining ventures whose names are pretty well known over here. It is presumed that work is still going on, but in many cases it must be after a desultory fashion, because the working capital, if not already exhausted, must be on the point of running dry, and in the present condition of affairs the raising of further funds would appear to be an absolute impossibility. That there is gold in Egypt admits of no doubt, and at one time it looked as though the Land of the Pharaohs would take a prominent place in the gold production of the world. It is to be feared that the original hopes of many have been falsified by events. The promoters almost unanimously blame Lord Cromer for the rigid manner in which he has supervised the formation of companies, and the numerous provisions (some of them of rather a drastic character) that promoters have had to observe before permission could be granted for the commencement of mining. On the other hand, Lord Cromer has taken up the position that only mines sufficiently developed to prove their worth should be allowed to pass into the hands of companies.

Stockholders in Stratton's Independence will welcome with satisfaction the announcement just made by the directors that the study of the problem of the dump and low-grade ore treatment, which had occupied the attention of various specialists on the subject for a lengthened period, has now been finally brought to a satisfactory conclusion by Mr. Philip Argall's investigations. The directors inform the shareholders by circular that the consulting engineer, Mr. Argall, has cabled the following report:

"Dump average may be taken as $3.60 per ton of 2,000 lb. Expect to recover about 70%. Estimated cost of treatment per ton, $1.50. Estimated profit per ton, $1, contingent upon milling 10,000 tons per month. Would suggest immediate erection of mill not less than 10,000 tons. Total estimated cost of construction amounts to $200,000 approximately. By this treatment I propose to deal also with the mine low-grade ore, and 50 tons per day high-grade ore plant is included in the estimate."

The directors point out that in Mr. Argall's plan of operation three sources of profitable milling are provided for, namely:

(1) The ore from the dump on which 600,000 tons are estimated as available.

(2) The utilization of the masses of low-grade ore in the mine hitherto unworkable, sufficient in the general manager's opinion to keep a large plant running for many years.

(3) The anticipated continued output of high-grade ore, the provision for which is up to 50 tons per day.

In their circular the directors further state that from this milling scheme, it would seem most probable that without including any new discoveries of ore beyond the area of the Company's property already explored, the mine may be counted upon to earn a substantial profit for a good many years, and while pointing out that the proposed outlay is well within the Company's own financial resources, they are of opinion that the money could not be better employed.

Johannesburg, Transvaal.

The Unemployed.—A Bad State of Affairs.—Dutch in Control of New Parliament.—Increase of Crime.—Annual Meeting of Chamber of Mines.—President's Speech.—Output of Gold.

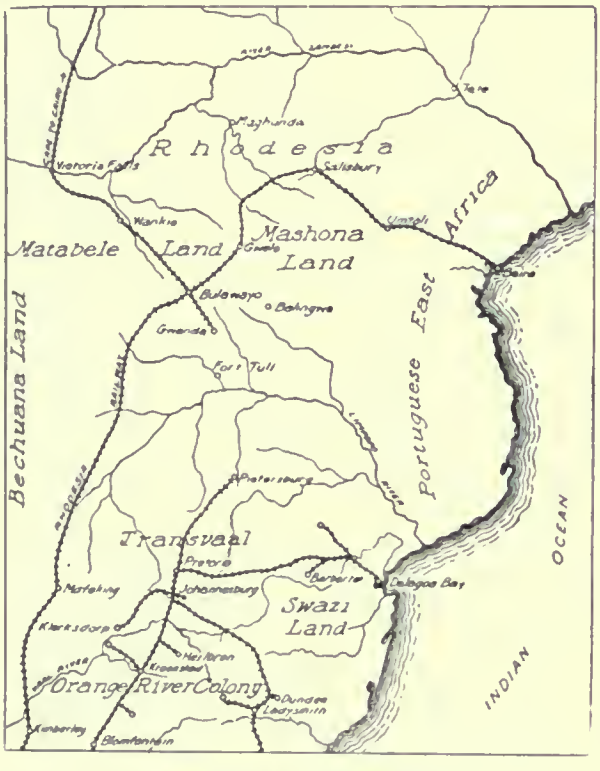
The problem of the unemployed is far from being settled. The mine managers have stated that they have no more room for white men, and the different municipalities find it impossible to put on any more. The Government has commenced road building in the Western Transvaal, but the wages offered to white men are low, so that few of the unemployed have applied for work. A silent procession of the unemployed parades the streets of Johannesburg several times a week. At the head of the column the destitute women and children ride in trolleys and behind the wagons in lines of fours march the unfortunate men who are 'hard up.' After tramping through the principal streets of Johannesburg the procession walks back to the camp, on the outskirts of the city. It is an unfortunate state of affairs. These people must be kept alive somehow, and the great danger is that they will live on charity so long that a number of them will become paupers, and lose their desire to exert themselves. Everyone feels the problem keenly, but as yet no solution has been found. The idea to send the destitute Australians back to their country, where there is plenty of work for them, is a good scheme, and it is to be hoped that it will be carried out.

After some days of waiting we now know who is to make up the first cabinet of the Transvaal. It is almost entirely a Boer ministry, and in this new British Colony the Dutch anguage will be of more importance in the Parliament than English. Still it is not thought that the Boer party will do anything rash. The general feeling is that the industrial outlook is not altogether bad, but that the political future, as far as the British party is concerned, is rather hopeless. Het Volk, the Dutch party, has obtained such a firm grip of affairs that it is unlikely the Progressive, or British, party will ever get into power. We are all waiting with bated breath for a speech from General Botha, the new Premier, who is expected to make a pronouncement of his party's policy, next week, at a dinner to be given the cabinet in Pretoria.

This is the time of year when reports of all kinds roll in. The report of the criminal department shows an unfortunate increase of crime in the Transvaal, especially along the Rand. As a rule a period of distress is found to produce an increase in crime, and the depression in the Transvaal during the past year accounts for much of

it. Unfortunately many white men out of work find the attractions of illicit gold-dealing and illicit liquor-trading too strong to be resisted. The selling of liquor to natives, against which there is a most stringent law, has grown during the past year, as has the illegal supplying of opium to Chinese. For a time the crime committed by Chinese was very high, but this has been greatly reduced in the past month or so.

The annual meeting of the Chamber of Mines was held a few days ago, and in his address the president touched on every topic affecting the industry at the present time. Most interesting were his remarks regarding Chinese labor on the Rand. If the thousands of coolies who are desirous of signing again for three years are allowed to do so, there can be little doubt that the Rand will have one of the finest forces of rough laborers in the world. The efficiency of the coolies has steadily improved, so that today mines with Chinese labor are working just as cheaply as with Kaffir labor. The following comparative figures from the Simmer & Jack, working with coolies, and the Robinson Deep, working with natives, are interesting:



Map of the African Goldfields.

	Chinese on the Simmer & Jack.	Natives on the Robinson Deep.
Average number employed	4,014	8,695
Average number working	3,753	2,274
Total number of shifts	289,275	184,078
Compound expenses (including time-office, but exclusive of Chinese wages), per shift, pence	10.930	8.647
Labor supply – procuring, repatriation fund, passport, fees, etc., per shift, pence	5.789	5.312
Wages per man per shift, pence	20.953	21.467
Total, pence	37.672	35.426

To refute the false statements made with such persistence by the Liberals, that the white managers are such tyrants that the coolies hate them, the president in his speech draws attention to the fact that on several mines the coolies have of their own free will presented the compound managers with gifts, to show their appreciation of the treatment they had received. On the whole the relations between the white bosses and the coolies are now satisfactory. The miners work with Chinese in preference to Kaffirs.

As was to be expected, the returns for February show a big drop in the output over January. Not only was it a short month, but the Chinese New Year celebrations which lasted three days hung up the mills on Chinese mines for two days or more. The total output for the Transvaal works out at 493,542 oz., valued at £2,096,434. This is a decrease of 44,096 oz., valued at £187,307, as compared with January. The value of the Rand output was £2,021,006, or 475,785 oz., leaving the outside districts to account for 17,757 oz., valued at £75,428. The largest producer for the month was the Robinson mine, with 21,514 oz.; next comes the Simmer & Jack with 21,100 oz. The number of coolies available for mines on February 28 was 53,736.

Leadville, Colorado.

Monthly Output.—Geological Report.—Special Maps.—Extension of Productive Area.—New Enterprises.—Reopening of Old Mine.—Activity on Rock Hill.

During the month of March the Leadville district produced approximately 75,000 tons of ore, which was distributed among the different smelting centres as follows: American Smelting & Refining Co., 60,000 tons; Colorado zinc mills and smelters, 12,000, and the Salida smelter, 3,000 tons. The lead smelters were not able to handle all the sulphide ore offered, which accounts in part for the failure of the district to reach its normal monthly production.

A publication of unusual interest to mining men generally and to Leadville mining men especially, will appear in a short time from the United States Geological Survey. The new publication will be a report supplementing the classic monograph formerly prepared by S. F. Emmons. A large portion of the district has been exposed by adits, shafts, and general development work since Mr. Emmons studied the district; consequently an exact portrayal of the geological formations is now possible. The report is being prepared by Mr. Emmons and J. D. Irving, formerly of Lehigh University, and recently appointed to a professorship at Yale. Among others, three special sets of maps will appear in the report; one of these will be devoted to the 'down town' district, which is now complete; a second, styled the Small Hopes section, in the vicinity of the Adams, Castle View, R. A. M., Mahala, Greenback, Wolftone, and other adjoining properties; and the third will embrace the region in the vicinity of Iron hill and the route of the Yak tunnel across Iron and Breece hills.

Until recently the district has been divided in the popular mind into 'inside' and 'outside' ground, referring in the former case to unproductive or questionable territory, and in the latter case to the area already mined and proved. The 'inside ground' referred to that which is bounded on the north by Big Evans gulch, on the east by Ball Mtn., on the south by Iowa gulch, and west by the city limits. It was within these limits that the early day bonanzas were developed. But the developments of the past few years have demonstrated that this area covered only a portion of the ore measures. The favorable parts may now be extended to a much greater area, in fact to all the territory that includes the lime and porphyry contacts or either of these with the quartzite formation. For example, the Boulder, Mammoth, and other properties lying to the north, have opened ore deposits, proving that a very valuable territory lies as far north as Prospect mountain.

One of the new enterprises on Rock hill, from which much is expected in the near future, is the Ovens Mining & Leasing Co., whose operations are under the management of Thos. Ovens. This company will operate under lease the Alhambra placer, which side-lines with the

Crescentia. A new shaft is being sunk and it is now over 300 ft. deep. From the available information, another 300 ft. will penetrate the lime-porphyry contact, where the management expects to expose the ore-shoot encountered by the Crescentia. A modern plant of machinery has been installed to push the work and as yet no body of water has interfered with progress. Another property on Rock hill, the Raven lease, under the management of Wm. Bowden, is making a good record. The lessees are shipping 25 tons of ore daily.

The Midland Mining Co. has recently secured the Mansfield group of claims, and active development work, under the management of F. J. McNair, has commenced. In the early days, a shaft was sunk on this property to a depth of 700 ft. An adit is being driven from Iowa gulch to tap the bottom of the shaft. The water problem was found to be a serious one, and this method was most practical for drainage. A plant of machinery will be installed later.——A shaft sunk on the Leo ground over 15 years ago opened a body of zinc-silver ore, but the zinc product at that time was unprofitable. Lately the shaft has been unwatered and development work indicates the ore-shoot to be a continuation of the mammoth Moyer ore-shoot, which, if correct, will assure the future of the property. The evidences of a big body of ore at the present time are most encouraging.

Butte, Montana.

Views of Mr. Thayer.—Activity in the Corbin District.—Butte & London Co.—Butte & Milwaukee.—Colusa-Leonard Extension.—Some Good Samples.—Misunderstanding of Their Character.—Samples Do not Make Mines.

Ben B. Thayer, assistant to the president of the Amalgamated Copper Co., is engaged in making an examination of all the mines and other properties of the various subsidiary companies of the Amalgamated. This company has many improvements under way and Mr. Thayer says the output in the next 12 months will be the heaviest in the history of the Butte district. The Washoe smelter is treating 10,000 tons of ore daily now, that being the full capacity. The Great Falls smelter is using about 4,000 tons and that plant is being enlarged so that it will be able to handle 5,000 tons per day. Development work in all the mines, he says, will continue on a greater scale than ever. Mr. Thayer, speaking about the metal market, said he could see nothing that could bring about a reduction in the price of copper for some time. "Copper prices are not made or controlled by a trust, but are regulated by the law of supply and demand," he said. "The present demand can not be satisfied by the present supply."

There is much activity in the Corbin district, 50 miles northeast of Butte, where the recently organized Boston & Corbin Co. is developing some properties. That company is employing 20 men and is making small shipments to the East Helena smelter. The ore is sulphide and is identical with the silver-copper ores of the Butte district. Since the advent of the Boston & Corbin Co. into the Corbin district a number of other companies have been organized and the owners of unproved claims are placing ridiculously high figures on their holdings. There are few producing mines in the district as yet. A company has been organized in New York to work an old mine known as the Silver King, which has been opened with an adit 1,000 ft. long. It is claimed that the Silver King yielded $125,000 worth of ore some years ago. The Daly group, in the same district, consisting of five claims, will also be worked. John Berkin, of Butte, has secured a lease and bond on the property and will at once unwater the workings. The pioneers in the Corbin district are A. H. S. Bird of Butte and W. S. McCornick of Salt Lake. They have been exploring a large tract of mineral ground there for five years or more. Their experts and engineers are confident that the property will develop into a good mine.

The Butte & London Copper Development Co. has adopted the contract system in shaft-sinking. Heretofore the company has done the work itself with day labor, but results have not been satisfactory. The bonus system was introduced a month ago, but it did not stimulate progress, and now a contract has been let to do the work. The company has been sinking its shaft for a year and it is nearly 1,000 ft. deep, but there are more than 500 ft. yet to be sunk. The contractor furnishes all labor, and the company provides material, power, and an engineer. The Butte & Milwaukee Copper Co. is making slow progress with its shaft on the Colonel Sellers claim, which is down only 180 ft. The company owns five claims in the district north of the North Butte mines. It has been working on the shaft nearly three and a half months, and its plant has a capacity for only about 600 ft., but it is said that a new plant of 2,000-ft. capacity is to be installed shortly, the machinery for it having been ordered. It is intended to sink the shaft deep enough to explore the four claims owned by the company. It will be at least several years before the ground is sufficiently tested, as it has been forcibly demonstrated that great depth is required to open mines in the outlying portions of the Butte district. A concern known as the Butte & New York Co. holds a majority of the stock of the Butte & Milwaukee Co., and it is through the New York company that operations are conducted. It has been announced that it was the intention later to exchange the new stock for the old, and by that promise threatened litigation was stayed. Now, however, it is stated by officers of the company that there will be no exchange at all.

The shaft of the Colusa-Leonard Extension Co. has reached a depth of nearly 590 ft. Progress has not been so rapid lately on account of the condition of the ground. The bottom of the shaft is in mineralized vein-matter, presumably part of the vein that was encountered several hundred feet higher in the shaft. From the stringers cut in the shaft some good samples were picked, from which assays as high as 9% copper have been obtained. Of course, these samples have not been taken from a commercial vein, and mining men take them only as being encouraging indications. The showing is satisfactory to the local management. Unfortunately, Eastern people that promote new copper companies, and people who buy stocks of new companies, generally know so little about mining that they imagine they have a mine when a sample of rock assays well, and men whose interests and enthusiasm outweighs their judgment sometimes encourage that idea. That has been the experience in Colusa-Leonard. When the encouraging conditions were encountered in the shaft some persons, and papers, published it as a 'strike,' conveying the impression that a great body of commercial ore had been opened and that dividends were already in sight. Such stories injure legitimate mining, though they may temporarily aid the sale of a stock. The stringers of ore in the Colusa-Leonard shaft, from which samples were picked and assayed, may come from a good vein, and they may not. In themselves they prove neither the one nor the other, and the problem cannot be proved until the shaft is sunk at least 1,500 ft. deep and cross-cuts are run. The country for miles about Butte is full of stringers and seams of ore, but not many of them have been developed into big mines.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Moore and Butters Filter.

The Editor:

Sir—Mr. Bosqui[1] has recently entered the discussion on the relative merits of the Moore and Butters filtering processes, and has criticized at some length my own contribution to that discussion.[2]

He justly says, that until a comparison of efficiency and operating costs is forthcoming no conclusion can be reached. He admits that the Moore process "may require less power," and seems willing to entertain the idea that it may be the cheaper to install. If we ignore the labor requirements which are the same in each case, namely, one man per shift to tend the filters, the remaining factors affecting the relative merits of the two processes are efficiency, maintenance, and repairs. To these Mr. Bosqui devotes his article chiefly, and develops an argument, from which he concludes that "the sum of advantages, in so far as we can estimate them, would seem to be on the side of the Butters-Cassel process, from whichever point of view we choose to take, whether that of a mechanic who is looking for the simplest mechanism, or of the metallurgist who is striving for the best net result and the lowest cost of operation."

An examination of Mr. Bosqui's argument, however, shows that he has simply marshalled together what he considers the advantages of the Butters process, and the disadvantages of the Moore process. This, it need scarcely be pointed out, is not the judicial method. He has laid stress chiefly on the stationary filter, and his argument tends to show that it is technically and commercially superior to the movable filter. I think a valid criticism of Mr. Bosqui's article is that he argues tendencies without estimating their quantitative effect, though really he has begged the whole question by saying "Obviously, to give the best results * * * there must be a uniform and quiescent condition of the filtering surface throughout."

If Mr. Bosqui's arguments demonstrate tendencies that are important in their effects, the results will show in the freedom from leaks of the filters, in the life of the filters, and in the efficiency of the wash. They can show nowhere else. It is worth while noting here, that the filtrate from neither process is fit for zinc-box precipitation without further clarifying. At the Combination mill the Butters-plant filtrate is pumped through an ordinary filter-press before going to the zinc-boxes. At Bodie the filtrate passed through a group of settlers in series, until a clarifying-filter set was installed. At the Liberty Bell, this latter practice was abandoned in favor of precipitating the clear decanted solution from the pulp-settlers, and returning the Moore-plant filtrate direct to the batteries without precipitation.

I have stated before that the Liberty Bell filters are being changed to a better type. The first of these were installed last July, and have been in continuous service since then without repairs. The indications are that they will last with but few repairs until the canvas rots. They should easily last a year and a half without much repair expense, and if they should do only this well, and then be renewed throughout, the cost per ton for filters would be only 1.2 cent.

As to the efficiency of the wash: At Bodie it was decided to wash to a cyanide strength of 0.15 lb. per ton of residual solution remaining in the cake next the canvas. After a deal of experimental work this was fixed as the economic limit; and after the Moore plant was in operation, it was regularly attained in practice, in a little less time than it took to form the cake.

At the Liberty Bell, the strength of the solution coming from the filters in wash, holds up nearly to the original strength in the pulp, until toward the end of the washing period, when it drops quickly. If there was serious short-circuiting through cracks or otherwise, the displaced solution would be lower in cyanide at the start, and there would be no definite end-point.

The following tests made on three successive basket-charges at the end of the 60-minute washing period by the Liberty Bell chemist, W. E. Tritch, confirm this and show conclusively that the wash is not inefficient.

	Samples of displaced solution.			Wash-water in vat.		
	Lb. KCN per ton....	Au in sol. Oz. per ton....	Ag in sol. Oz. per ton....	Lb. KCN per ton....	Oz. Au per ton....	Oz. Ag per ton....
No. 1	0.14	0.002	0.03	0.07	0.0006	0.025
No. 2	0.12	0.0026	0.03	0.07	0.0006	0.025
No. 3	0.14	0.003	0.035	0.07	0.0006	0.025

In addition, cake-samples were taken and carefully washed by decantation with measured amounts of water, and the cyanide strength calculated for the moisture in the cake. An average of five samplings gave 0.067 lb. more cyanide per ton of solution in the cake than in the wash-water, the greatest difference being 0.12 lb. per ton.

Mr. Bosqui says: "The maintenance of the slime cake in the best condition for the displacement by water is a delicate operation requiring careful manipulation." This applies to the Butters and not to the Moore process, and for this reason: The assumed detrimental condition is the formation of cracks in the cake. Their avoidance is the objective. Now it has been my experience with the Moore plant that cracking is chiefly a function of air-drying, that air-drying varies with the time the cake is exposed to the air while under vacuum, and with the amount of that vacuum. I surmise that this has been Mr. Bosqui's experience, as well, for he says, that during the transfer of pulp, wash-water, etc., "the vacuum is reduced just enough to hold the cake, in loose adherence, to the canvas, yet not enough to dry and crack the cake."

In the Moore plant at the Liberty Bell this "careful manipulation" is not necessary. It is only four minutes from submergence to submergence of the filters, and the cake cannot dry out enough in that time to crack, and, furthermore, does not crack, and the transfer can be made with full vacuum. No particular care is needed. During the corresponding operation with the Butters process, the cake is exposed under vacuum to the air for 30 or 40 minutes, and "careful manipulation" *is* necessary, from what Mr. Bosqui says, to keep it from cracking.

Mr. Bosqui's list of wrongs suffered by the Moore filter during transfer are without appreciable quantitative effect where the transfer is made under vacuum. Where the transfer is made regularly without vacuum, as was tried for a time at the Liberty Bell, and abandoned, the tendencies he outlines are serious, and the results are not good.

From the nature of the case, a greater variation in design is possible with the Moore process than with the Butters process. Consequently, the evolutionary period for the Moore process will be longer before experience indicates which is the best design for a given set of conditions. For the same reason, the early Butters plants were nearer their highest possibilities than were the early

[1] MINING AND SCIENTIFIC PRESS, February 2, 1907, Page 148.
[2] MINING AND SCIENTIFIC PRESS, December 15, 1906, Page 714.

Moore plants, and the Moore process has greater remaining possibilities.

From the various contributions so far made to this discussion, the following I think may be derived: The operating labor is the same for both systems. The power requirements are less for the Moore process. The technical effeciences are about equal. The first cost of a Moore installation is less, and consequently the amortization and insurance charges are less. The royalty charges should be the same. Undoubtedly the Butters process has so far made the best showing for filter-repair expense. It seems probable, however, that the new Liberty Bell filters will compare favorably with the Butters filters.

In conclusion, I think Mr. Bosqui's dictum that the sum of advantages lies with the Butters-Cassel process is based on insufficient grounds, and is incorrect. For small plants, there is probably little to choose between the processes. For plants of medium size with a treatment capacity of, say, 100 to 200 tons per day, where a good side-hill site is available, thereby rendering possible a gravity discharge for the Butters filter-boxes, the operating expenses of the two processes should be abont the same, with the first cost in favor of the Moore plant. Where large tonnages are to be treated, however, or where a side-hill site cannot be had, the inherent advantages of the Moore process, namely its lower power requirements, its greater compactness, its lower first cost, and the higher time efficiency of its filtering units, become of increasing importance, and outweigh, I think, whatever difference in repairs there may be in favor of the stationary filter. In the light of the experience so far obtained with the Moore process, I think there is no question but that rational design, taking account of all possible contingencies whose quantitative effects have been proved important, will eliminate, practically, the faults that have so far developed.

I have just read Mr. Pettis' contribution to this discussion in the MINING AND SCIENTIFIC PRESS of March 23, and I think that his conclusion in the final paragraph is covered by the foregoing. It is worth remembering that the credit for the vacuum-filtration processes really belongs to George Moore. The Butters-Cassel process is merely an inversion technically and historically of Moore's original process, and the greater honor, therefore, belongs to Moore. Had he realized and patented the essential feature, namely, the removal of the filtered cake from the remaining unfiltered pulp by means of its adherence to the filter cloth, as Mr. Brown has pointed out, there would have been no chance for this controversy of the relative merits of the Moore and Butters-Cassel processes.

EDWARD H. NUTTER.

Telluride, Colorado, March 30.

IN THE RE-BUILDING of San Francisco, methods of economical leveling and construction have been sought out and practised to the maximum degree. As an instance typical of this, we may cite the work done on the Crocker building, standing at the corner of Post and Market streets, where every avenue to waste, both material and labor, has been most successfully closed through the exercise of a little ingenuity and forethought, aided by the best of modern crushing machinery. This structure, which is ten stories in height, with a frontage of about 200 ft., escaped any serious damage from the earthquake, but was gutted by fire. The frame of the building being intact, nothing more was necessary than a reconstruction of its interior, and the contractors at once hit upon the profitable plan of utilizing for concrete mixture all bricks, tiling, stone-work, and flooring, that had to be removed. Suitable apparatus was therefore installed, and, as fast as the work of tearing down made this material available, it went directly to a Gates breaker fed from bins supplied by chutes from various parts of the building. After being crushed to the desired fineness, the product of the breaker passed to a mixer, and as the concrete material issued from the latter, it was taken by a system of elevators and conveyors to all parts of the building where needed.

The Ferry Building, San Francisco.

The San Francisco of Today.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

San Francisco lives, with a throbbing life that pulsates through every artery of her multifarious commerce; the sorrowful yesterday and the hopeful tomorrow serve but to enclose a vivid present. It is only a year since a catastrophe, unexpected as a collision with a vagrant comet, devastated her marts and consumed her stores, yet today she presents an aspect that appeals less to the sentimentalist wanting to bemoan a doleful fate than to the man of action keen to appreciate a recovery magnificent in its vigor. Certainly to those whose privilege it is to take part in the rebuilding of a great city and to be an insignificant portion of her renewed vitality, the spectacle of the rehabilitation of San Francisco is immensely stimulating. To those who knew San Francisco in former hours of silken ease, to the mining engineer whose nomadic steps brought him frequently within her hospitable walls, to the prospector who was wont to tarry awhile among surroundings so full of contrast to his rigorous calling, to the seaman to whom the Contra Costa hills ever looked a welcome across the Golden Gate, to all of these, if haply they be in other lands, the picture of her reconstruction will touch a reminiscent chord. The story is told elsewhere in this journal by two engineers better qualified than the writer, but for the sake of those that want to know just how San Francisco looks, we give three or four photographs that tell their story more eloquently than words.

Looking Down Market Street.

First comes the Ferry building. This is the gateway familiar to every traveler. Amid the devastation of the earthquake-fire the tower of the Ferry building stood a silent sentinel. Had it fallen, the effect would have been intensely depressing. How nearly it collapsed is known only to those who examined it after the earth tremor had passed. This imposing structure is farthest from solid ground, for it stands on the sea-wall, all the space intervening between it and Montgomery street, a distance of half a mile, being filled ground, won from the margin of the bay. The building stands on piles that were sunk 60 ft. into the mud, without reaching solid rock; the anchorage is on concrete surmounting the piles. The tower itself has no base, it rests on two heavy girders that cross the main exit of the building. Hence the earthquake swung it cruelly. The tie-rods were displaced as much as 16 inches, the rivets were sheared, and the plates broke away, leaving the entire structure in a shaky condition, although it did not fall, and the lower part of the building remained in service during the conflagration and the anxious days that followed. Among those to suffer from the disarrangement were the officials of the State Mining Bureau, whose quarters are on the third floor. The terra cotta tiling, which lined the inside of the tower, fell down, and into the storerooms of the Bureau. The ceilings were made of plaster spread on wire; the cracks ran along the joints of the wire mats and from each crack the plaster descended. Some of the stones of the tower itself dropped through the slate roof over the laboratory and drafting-rooms of the Bureau. A few days afterward a heavy rainstorm flooded the library and injured the hanging maps, although the books themselves were saved by covering the cases with tarpaulin, until the repairs were made, during the past month. In the museum, the vibration displaced the labels of the mineral specimens, so that they had to be freshly identified and re-labeled. Some side cases tumbled, breaking the glass, and in a few instances it happened that they fell over horizontal cases, so that the contents of both became mixed. On the whole, however, the result was mainly inconvenience to the officials, for no serious damage was done to the valuable possessions of the Bureau.

The tower has been re-covered with concrete made from the material obtained by crushing the blocks of sandstone with which it was formerly veneered. The main building was not seriously injured and retains its stonework. The photograph shows the new loop for the trolley

service, in place of the old turn-table. It is to the credit of the Federal Government that the reconstruction of the tower was completed within six months. The clock has a new white dial and its hands once more mark time for the thousands that cross the Bay every morning and evening.

Another photograph gives a view looking down Market street, toward the ferry. Market street is the Broadway of San Francisco, its main avenue, and its greatest thoroughfare. The view is taken from the Flood building, a big structure that survived the earthquake and has been put into service, being occupied mainly by the offices of the railroad companies. In the right foreground is seen the first floor of what is to be the largest reinforced concrete building in existence. It is the Pacific building and is to have nine stories. Since the photograph was taken it has been constructed as far as the third story. The photograph shows a group of men feeding a gyratory crusher, the product of which descends into a concrete mixer in the basement. Along the platform in front are openings to admit the descent of stone that does not need crushing. It may be mentioned that in many cases the stone taken from wrecked buildings is being crushed on the spot for use in concrete applied to new buildings. Thus the granite of the old Stock Exchange is reduced for employment on the new Hopkins building on Pine street. Brick from the ruins is also used in this way, tests having proved that it is safe to do so. Even old concrete is crushed and made part of a fresh mixture. In this way much of the old San Francisco helps to build the new city that is rising from the ruins.

The gore in the left foreground, made by the junction of Ellis and Market streets, is to be occupied by an eight-story concrete building. On the corner opposite, but on the same side of Market street, the Union Trust building will be erected. The tall structure in course of construction almost in the centre of the picture is the Humboldt Savings Bank, which will be a new feature of the City. The site had just been cleared at the time of the conflagration. It testifies to the nerve of the people of San Francisco that after the fire the owners decided to make the building five stories higher, involving an additional expenditure of $150,000. The construction is of reinforced concrete on a steel frame and the engineers are Lindgren & Hicks, the latter being the author of an article on another page of this issue. Lower down the street on the right is seen the exposed side of the Kamm building, occupied by Uhl Brothers, dealers in wall-paper; this was partly destroyed and has been partly renovated. The front of it did not suffer much, but the back of it, where the paper was stored, was injured by the fire.

A little farther down Market street, and the dominating feature of the picture, is the Call or Spreckels building, which, in many respects, represents the most signal triumph of mind over matter, of engineering skill over nature's unrest. For this structure, 320 ft. high, survived the earthquake, though swept by the fire. The top of it must have rocked more than a foot, and probably 18 inches, during the earth tremors of April 18, 1906. From the thirteenth story upward the stone exterior was loosened, so as to require re-setting, but the great steel frame remained intact. In the basement are the vaults of the National Bank of the Pacific, and it is worthy of record that after the fire was spent and the building cooled, the mechanism of the ponderous doors worked perfectly, proving that they had not shifted a hair's breadth. After the partial destruction of the City, this towering structure stood like a lighthouse amid a sea of devastation. Of the Examiner or Hearst* building on the opposite side of Third street, there was nothing left after the earthquake and fire had done their work, although previous to the event it had presented a bold front of stuccoed pretence. This building had self-supporting walls and was not of the modern type; it is to be succeeded by a 22-story structure of improved design.

Below the Call building is the Monadnock, a large office building approaching completion at the time of the disaster. It has become an important hive of activity since then and its modern steel structure was tested by the earthquake with results satisfactory to all concerned. Though not of heavy construction nor of the finest type of steel frame, it did well, especially when it is noted that the west wall was lacking at the time of the earthquake, so that it was an unfinished three-sided box, calculated to feel the vibration severely. That end of the building is now being completed.

Still farther down Market street, too far for the photograph, there comes a sad gap—the site of the Palace hotel. This landmark of San Francisco, built thirty years ago, was gutted by the fire, but its brick walls stood in gaunt desolation until torn down, to make room for a new and more handsome building. The walls were reinforced with iron rods and straps; the building was honeycombed with interior brick partitions, and this vital feature made it particularly well adapted to resist a shock. The Palace hotel was built just after the earthquake of 1868 and the builders had made provision for such an occurrence, never foreseeing that a general conflagration would be the accompaniment of the other danger. Even the large charges of dynamite exploded in the futile effort to stay the advance of the conflagration, failed to bring down this building, although they injured others in the vicinity. The inefficient use of dynamite was a feature of the San Francisco fire that is particularly regrettable, for it was successful mining that was responsible for the early growth of the City. The authorities used the explosives like farmers, at a time when the advice of numerous mining men was readily available.

Coming back, up the street, on the left is the white front of the Mutual Savings Bank building, at the corner of Kearney and Market streets. Just beyond rises the dark mass of the new Chronicle building, a modern steel structure that passed through the trial without serious injury from the earthquake, while the adjoining old Chronicle building was shaken and badly injured by the fire. Moreover, the presses and other heavy machinery on the top story fell through and shattered the successive floors underneath. The framework rising from the street, and indistinctly observable in the photograph, is the scaffolding in use for tearing down the old Chronicle building, which was erected twenty years ago, and was the first of the skyscrapers in San Francisco.

For the sake of old times we publish a photograph of that part of the City where Montgomery street meets Market and Post streets. To the left are the Grand and Palace hotels, with the Call building in the distance; in the middle comes the gore of the Crocker building, like the prow of a great ship; to the right is the Hobart, adjoining the Union Trust, building; and just above it is the Masonic Temple. At least they *were* there; the present tense is not permissible in every case. But even this pathetic reminder need not depress a citizen of San Francisco, for on the site shown in this photograph there will be a group of buildings more superb even than those of the past. On the site of the Grand hotel there is to be erected the 14-story building — of steel, stone, and terra cotta — of the Metropolitan Banking Co. The new Palace hotel will have 10 stories, probably faced with brick and terra cotta. The Call and Crocker buildings have already been renovated, and will look just as they

*The three leading newspapers of San Francisco are the *Call* owned by J. D. Spreckels, the *Chronicle* of M. H. de Young, and the *Examiner* of W. R. Hearst.

used to. The Union Trust building is being handsomely repaired. On the site of the former Masonic Temple there will be a splendid 12-story building, probably the finest banking establishment in California. It will be occupied by the First National Bank; the first three stories will be faced with granite, the next eight with pressed brick, and the top story with terra cotta. West of the Crocker building, between it and the Chronicle, will be a 10-story office building, running back to the site of the former Mechanics Library. It is obvious, therefore, that the financial centre of San Francisco is destined shortly to present a superb appearance.

Finally, in the last photograph we have a bit of the ruins, not in their unkempt disheartening ugliness, but with a touch of poetry. This Greek portico, with its Ionic columns and Doric freize, was the doorway of the house of Mr. A. N. Towne, on California street. It looks like a bit of Palmyra or Corinth; the blasted palm is eloquent of disaster and the marble columns give mute evidence of the flames that overwhelmed a beautiful home. To the left are the gaunt spectres of several tall buildings and past the columns there looms the City Hall.

This portico served as a subject for an impressionist picture by Charles Rollo Peters, who represented the scene under the mantle of night. He called it 'The Portals of the Past.' And if you go there, on the top of California hill, you can see now, through the portals of the future, a greater city rising from the ruins of the old San Francisco. The merry sound of the riveters, the clang of hammers, the confident voices of engineers, can be heard. A score of giant steel buildings stand in conquering strength amid the ruins of the wooden structures that the fire destroyed; already the site of these is being occupied by brick buildings of various sizes, and the ground is being prepared for the architect. To the west is the portion of San Francisco that escaped the fire, it makes a big town in itself, and it shows but few marks of the earthquake. To the northward is the magnificent form of the Fairmont hotel, a noble white building in the style of the Italian renaissance, which was nearly finished at the time of the fire, and was not seriously injured by the earthquake. It is to be opened with proper ceremony on the anniversary of the disaster. Beyond are Telegraph and Russian hills, whose sides were practically swept clean by the conflagration, but they are now thickly dotted with dwellings. The old ghastly sky line, with its grim evenness of contour is broken by habitations, and the scene is one of cheerful restoration. Turning to the right, there stretches the heart of the City, where its offices, stores, and banking houses stood in confident security on the night of April 17, to become a seething furnace twenty-four hours later. You would not believe it now, for the skyscrapers remain, most of them rehabilitated and renovated, thousands of new buildings have sprung up, the street cars are moving, the pavements are crowded with hurrying people, the walls of buildings in course of construction are dotted with workmen, the wooden frames of reinforced concrete rise everywhere, the thump of the pile driver is heard, and the whistle of the steam engine. All is life and activity. On the water-front is the tower of the Ferry building, and beyond it lies the blue expanse of the Bay, dotted with green islands, furrowed by the white ferryboats; farther still rise the Contra Costa hills, in peaceful beauty, dreaming in a purple haze, athrob with soft enchantment. The touch of sadness has gone, it is a vivid life that throbs all around, it is unresting energy that vibrates in the air, we look through the portals of the future and feel glad again as "in the days when the world was young and life an epic."

The Portals of the Past.

A Year of Reconstruction.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES DERLETH, JR.

In the following description, it is my purpose to give a short review of the extent of structural damage within the earthquake and fire belt of April, 1906, followed by a general outline of the amount of rehabilitation accomplished during the past twelve months.

There is no need to tell the story of disaster. Enough has been said on that score; still, many of my readers no doubt are quite unfamiliar, after all, with the magnitude of destruction, especially in San Francisco, so that some reference at least to the extent of fire and earthquake losses is necessary in order that one may better appreciate the enormous amount of rebuilding and repairing that has been accomplished already.

It is my intention to devote my remarks particularly to San Francisco, because of the enormous losses in that city due to the subsequent fire. Many persons have purposely over-emphasized the destructive effects of the conflagration, both in San Francisco and Santa Rosa, with the mistaken notion that any argument that appeared to divert attention from the earthquake would be beneficial to the home community. I have never sympathized with that attitude of mind, which would tend to belittle the earthquake as a primary cause. The property and business interests of San Francisco and its vicinity have nothing to lose by frankly admitting that there was an earthquake in California, that it meted out considerable damage, and that it was the prime reason for the great fire.

It is possible that in the future our community may be again startled by earth vibrations; but this possibility should not detract from the importance of San Francisco as a thriving and growing centre of trade. I am perfectly convinced that a straightforward exposition of the destruction of April, 1906, is to be encouraged on every side, in order that there may be a more general and thorough understanding of our local engineering and architectural problems, especially since it can most decidedly be shown that first-class constructions of the various types, from modest wooden buildings to modern fire-proof steel-framed sky-scrapers are thoroughly able to withstand an earth tremor of the severity of the *temblor* that visited California a year ago. With honest and scientific construction, there never could have been, except at places on the line of the fault itself, such a complete collapse and disintegration of structures as to promote a general conflagration. With high-grade building, even with the cutting off of the water supply of a great city, fires could not start in many places at the same time, and the menace of a conflagration might be avoided. In San Francisco, within half an hour after the earthquake, fires were reported in nearly sixty different places, and always among cheap buildings of wood or brick construction. It was not in the first-class buildings that fires started.

The important destruction to engineering works was found in a belt about 50 miles wide and nearly 400 miles long, extending along the Pacific Coast with the Bay of San Francisco at its centre.

Within this belt the most severe racking of structures occurred right on the fault-line, the most striking examples being the Pilarcitos conduit, the San Andreas dam of the Spring Valley Water Co., and the Pajaro bridge on the Southern Pacific railroad, about 1,500 ft. south of Chittenden station, where the railroad crosses the Pajaro river. These structures, all well designed, were much damaged, or even ruined, as in the case of the Pilarcitos conduit, because of the large and unequal movements of the ground along the rift.

The intensity of shock within the earthquake belt varied greatly. Well built structures that rested on hard and rocky surfaces were little damaged. Rock formations and structures resting upon them were shaken by an elastic vibration without differential movements of the surface materials, and in such instances wherever the construction was intelligent and honest, it withstood the shock. There are many examples of successful resistance on the hard ground summits in San Francisco. Comparatively little damage was done in cities like Santa Cruz, San Rafael, and Berkeley, which rest on a rock foundation, or other sound coherent material.

Within the belt of great destruction are found many spots where decided differential surface movements occurred, though at a distance east or west of the fault-line. Examination shows localities to be overlaid with loose incoherent material. In one place, we find a loose river deposit; in another, a marsh; in a third, an artificial fill. Examples of destruction in such localities are found (1) near Salinas, where the Spreckels sugar mill, a first-class steel cage constructed building, was much racked; (2) in the San Bruno marsh, near South San Francisco, where the Crystal Spring conduit of the Spring Valley Water Co. was smashed; (3) on the filled areas of San Francisco in the Mission district, and along the water front, near the Ferry building, where the street surfaces were deformed into waves, and structures with weak and faulty foundations were so generally destroyed.

In all these cases the differential motions were of a secondary nature, and not directly connected with the movements along the fault-line. The general vibration of the earth's crust caused marshes that were near the centre of disturbance to shake like bowls of jelly; and alluvial deposits and artificially filled lands were much shaken and shifted upon the firmer ground beneath them.

Within the belt of great disturbance there was a line of less intensity of shock approximately parallel to the fault and traversing the bottom lands of the valleys that contain Santa Rosa and Healdsburg in the north, and Agnews and San Jose in the south, with the bay of San Francisco as a central feature. These bottom lands are alluvial deposits of soft incoherent material; structures resting upon them were severely shaken, though in general there was little, if any, differential movement of the ground in such cities as Santa Rosa and San Jose. Structures situated near the foothills of these same valleys and resting on firmer ground were observed to suffer very much less.

It should be remembered that within the earthquake belt there was much destruction in Santa Rosa, San Jose, in the Salinas valley, at the Agnews Insane Asylum, Stanford University, Redwood City, Inverness, and the region of Tomales bay, in general along the fault, and in particular in the city of San Francisco. In these localities, except where there were unequal movements of the ground, or where structures were extremely near the line of rift, and therefore were subjected to violent vibrations, the unusual amount of earthquake shattering can and must be ascribed to faulty, ill-advised, or dishonest construction.

To an eye-witness visiting these places immediately after the catastrophe, the impression was depressing indeed. One could hardly believe that so much racking, shattering, and collapse could ever be repaired within a reasonable amount of time. One certainly got such an idea by visiting San Jose, Palo Alto, or Agnews. After all, however, the earthquake destruction was relatively slight, say five or ten per cent of the total damage, when compared to the wreck of fire in San Francisco and Santa Rosa. To the eye-witness of these conflagrations and

their results, it seemed well-nigh impossible that order could be brought out of chaos so soon.

During the past six months I have conversed with many visitors to San Francisco. A common remark made by the stranger is: "Why, I expected to see more building within the limits of the fire area in San Francisco." Such statements are usually made on the spur of the moment and without careful thinking. They never would be made by one conversant with building operations; indeed, they appear almost profane to one who lived in the ruins a year ago, and who has seen day by day what has been accomplished against great odds.

Last week I spent several days in San Jose, and except for a few shattered and unoccupied buildings like the City Hall, the State Normal School, a High School or two, and one or two churches, one would hardly know that the city had been so terribly racked a year ago. The business streets are as active as ever, and the scars of earthquake and small local fires have been almost entirely removed. It is well to notice that the scars still remaining in San Jose mainly represent either municipal construction or buildings of private community enterprise. The same observation may justly be made for other centres of population within the earthquake belt. In every case the worst destructions are observed in public enterprises, which leads me to a criticism which I think can be made in general for cities in the United States; namely, that the poorest buildings are generally public structures. In California, the earthquake brought home vividly at least the partial truth of this remark. It is a sad reflection that cities and communities all over the United States are lax in their building of municipal and public structures. On the other hand, the Federal buildings proved the excellence of the work done by the Government, for they were among the few that survived intact. The people, in erecting city buildings, schoolhouses, or churches, expect far too much for the money appropriated. The result is improper construction, and we need not wonder then that public structures showed themselves to be seriously weak when tested by the earthquake.

Structures of this kind were helpless in withstanding conflagrations, as they were not sufficiently fire-proofed. Herein may be noted one of the great lessons of the earthquake and fire. It seems, however, that the American people, like the rest of humanity, like to forget disagreeable circumstances. The citizens of San Francisco, for instance, appear no longer seriously to consider many of the great improvements that were to be introduced into the reconstructed city. For example, much has been said regarding the necessities of further fire protection, construction of local and distributing reservoirs, the introduction of salt-water systems of pipes in the business district, the widening of streets, the introduction of fire limits within which only Class A buildings might be constructed, provision for fire-boats, and so forth.

A Bit of the Old San Francisco.

In Santa Rosa the fire obliterated the business part of the city. This was caused by the general collapse of brick buildings at that place. The business portion of Santa Rosa burned because fires started simultaneously in the rubbish, and the facilities for fighting a conflagration were too limited. There was never a lack of water, as in the case of San Francisco. Nearly all the brick buildings were thrown to the ground by the *temblor* because they were carelessly constructed, and because the lime-mortar used and bond of brick-work were especially poor. However, if one goes to Santa Rosa today, the main street is again as active as ever; and everywhere within the heart of the town, structures of importance

are being erected, generally of a type far superior to those that existed before the fire.

At Stanford University, a commission consisting of Professors Marx, Wing, and Durand, has been pushing the reconstruction of the Campus buildings and most substantial progress has been made in repairing the older buildings and the arcades that connect them. Similar encouraging statements may be made in regard to repairs and reconstruction in Redwood City, Inverness, and other smaller centres, as well as for individual important structures that stood near the fault; for example, the Pajaro bridge at Chittenden and the Spreckels sugar factory at Salinas.

Of necessity, the great destruction to the Spring Valley Water Co.'s conduits was rushed, and most of the important work done on repairing the main pipe-lines was accomplished within the first month following the fire. Particular reference need not be made at this time to the substantial and stupendous water works reconstruction of those early days, because much has already been written on that topic. Moreover, the report of Mr. Herman Schussler, chief engineer of the Spring Valley Water Co., leaves little to be said. This report appeared some months ago.

In San Francisco, the first necessities demanded the housing of the homeless people and the sheltering of business activities. Of hardly less pressing importance were the traffic problems; the opening of streets and repairing of electric car-lines. Incident to these traffic problems, of course, came the question of removal of rubbish and debris.

The amount of work that has been done in the building of temporary homes, temporary business offices, and warehouses, in the clearing of streets and removal of rubbish from sites for new buildings, in the repair of street-car lines and the rehabilitation of power-houses, water and gas mains, sewers, etc., has been, during the past twelve months, decidedly stupendous. This gigantic work has been done and its effect is visible in the rapidly returning life and regular activities of the City; but to the stranger, the result may not appear commensurate with the effort. These labors, great as they are, do not show new buildings and ornamentation; they do not directly help to adorn the general landscape.

The whole northeastern portion of the city bordering on the Bay, stretching to Black Point and the Presidio on the west, and containing Telegraph and Russian hills, was practically wiped out by the fire. If one stands today on Nob hill in the vicinity of the magnificent Fairmont hotel, one sees in that burned district innumerable houses, frame to be sure, but substantially built, covering almost the entire area. These represent some of the new and necessary homes of San Francisco. Looking south from Nob hill, one can command a view of the Mission district, most of which, too, was entirely swept by flames; and there again, one now sees after a lapse of twelve months, innumerable small frame and brick houses, completed, or in course of construction, for the use of stores and dwellings; and interspersed with these smaller houses, many larger ones of brick or concrete for factory and warehouse purposes.

The great fire consumed nearly every house in the region of the city bordering the east side of Van Ness avenue. The passage of ten months saw that avenue of rich dwellings turned into a busy retail district for shoppers. The buildings in this vicinity are mainly of wood. They were hastily constructed for store purposes and must be considered temporary. Nevertheless, temporary as they may be, these buildings represent a large outlay of capital and an enormous expenditure of labor. From Van Ness avenue, eastward, upon ground that was swept clear of houses, building after building has been erected; the first ones were wood and cheaply constructed, but those lately begun are substantial, brick walled, mainly of Class C type, for stores, dwellings, apartments, or business. In short, the whole burned district is covered with wood and brick buildings; many are of temporary character, but in total they represent a most wonderful exhibition for twelve months of labor.

While most of the streets are cleaned of debris, many of them are still in a deplorable condition, because of the necessity of repair to sewers and water-pipes, to gas-mains, etc. The work which has been done in these respects is stupendous. To the visitor seeing the City for the first time since the great destruction, it is the sight in the streets of open trenches for sewer and water-pipe repairs, and the deep holes on adjoining building sites representing foundation operations, that give an idea of disorder and slow improvement, especially in the lower Market street district. But to one who appreciates the situation these are indications of great advancement. The rubbish has been cleared away, a great number of buildings, temporary and permanent, have been built, traffic has resumed, and business is on a more active basis than ever before. The bank clearings of San Francisco are greater than they were a year ago.

While it is true that the streets are still torn up in places, notably on lower Market street, and while it is to be observed that in the business district many of the most important and valuable building sites are mere excavations, it should be remembered that innumerable substantial foundations for new structures have been sunk, and that the vital things of city life have been replaced during the past twelve months. All is in readiness now for detailed, visible, and permanent construction.

From the preceding remarks, a distant reader might imagine that as yet there were no new or rehabilitated buildings of first-class construction in use in the heart of the City. Let me remark that about 20 Class A buildings passed through the conflagration, and a number of them have been tenanted for several months. The Kohl, Monadnock, and Atlas buildings, with some inconvenience at first, housed tenants within three months after the fire.

To give a good picture of what has been done in the heart of the City, and what may be expected within the next six months, it might not be amiss to speak in particular, on the one hand, of some of the important structures that passed through the fire and have already been repaired, and on the other, of buildings that were begun after the fire and are now nearing completion.

The fire completely destroyed all Class C buildings, and those Class B structures of brick-work and stone, whose interior floors and walls were of wood, or partially of wood.

Notable instances of the more substantial buildings belonging to the B Class, which were destroyed, are the Emporium and the Palace hotel. The Palace hotel has been completely torn down; the Emporium is being dismantled, and probably a part of it will be retained in the reconstruction. It is well to note that, of all the building types, the fire ruins of the best examples of Class B construction offer the greatest hindrance to the reconstruction of the City. A conflagration usually destroys them completely so far as possible repair is concerned, but leaves the remains sufficiently intact to make it necessary to expend large sums of money, and to consume much time, in razing them.

Structures with self-supporting outer walls and independent interior frames of rolled steel with fire-proof floors and partitions are not desirable. The best of them

cost as much as first-class steel-frame curtain-walled buildings. In the event of a conflagration, however, they are dreadfully damaged and leave costly ruins. The Sloane building, the Academy of Sciences, the old Chronicle building, the Mills building, the Spring Valley building, and the Wells-Fargo building support this argument. Most of these structures, together with a few others, are now being repaired, at great cost and consumption of time. The difficulties presented by their reconstruction are apparent when we consider how little has been done in either razing or repairing such buildings, especially in comparison to the repair of the few Class A structures that passed through the same conflagration.

By Class A is meant buildings with steel frames, supporting all wall and floor loads, with all parts fireproofed. A list of such structures existing in San Francisco at the time of the fire with details of construction

The Kohl, the Merchants Exchange, and the Mills Buildings.

is given in the accompanying table, taken from the earthquake report made by the local association to the American Society of Civil Engineers. Although gutted by the flames and greatly damaged, they nevertheless presented to the fire a decided resistance in comparison to the dangerous hulks left of buildings that had self-supporting walls. From these statements it must not be supposed that the Class A structures in San Francisco went through the fire comparatively unharmed. Their frames, structurally, were mainly left in safe condition; but buildings as a whole were greatly damaged. Studies of the Baltimore and San Francisco conflagrations show that first-class fire-proof buildings exposed to a conflagration may be expected to sustain heavy damage on all items of construction except foundations and steel frame. These two items represent approximately 20% of the value, and to this may be added about 10% for other salvage, chiefly masonry work; thus giving 70% damage. On account of the high prices for labor and materials in San Francisco during the past year, the cost of repairs to Class A buildings has, in some cases, been equal to the original cost of the structure.

These statements may seem unreasonable, and it may appear paradoxical to state that a first-class fire-proof building may, by conflagration, be damaged to an extent of at least 70% of its original value. Nevertheless, buildings of this type must be encouraged, as they retard and possibly limit conflagrations when properly grouped, especially if window and other exterior openings are protected. In San Francisco the Class A buildings were especially lacking in exterior protection. In a building like the Call the elevator-shafts acted like chimneys under forced draught. Intelligently equipped Class A buildings, properly grouped, and protected at exterior and interior openings and shafts, in combination with efficient city fire departments and a more general use of local water-supplies with automatic sprinkler-systems for individual important buildings, will decidedly help to retard the spread of a general fire.

There are many other reasons why Class A buildings should be encouraged, because even when gutted by flames, and with 70% of the first cost destroyed, they are, comparatively speaking, readily rehabilitated, thus permitting a quicker resumption of business and a great saving of rents. In San Francisco, this observation has brought home keenly the value of first-class buildings, as against the Class B, even of the best type. The Monadnock has been occupied for at least six months, the magnificent Flood building appears today almost without a blemish; yet across the street, the ruins of the Emporium look almost as bad as they did the day the fire stopped. The Mills building, the Sloane, the Academy of Sciences, the old Chronicle building, are still mere hulks, and it will be many months before these repaired structures will be ready for occupancy.

All this time rents are being lost and business is retarded. On the other hand, structures like the Fairmont hotel, the Call building, the St. Francis hotel, the

Marston building, the Merchants Exchange, the Mutual Savings Bank, the new Chronicle building, the Telephone building, the Shreve, the Kohl, the Bullock & Jones, the Atlas, and a few others are already alive with life and business.

In repairing some of these structures, many extremely interesting problems of repair and reconstruction have been presented. One of the most fascinating of them has been the shoring up of walls or floors of enormous weight in order to take out and replace steel columns that buckled from heat, due to faulty fire-proofing, or to the collapse of fire-proofing from especially great and prolonged heat. One might dwell on the topics of reconstruction of San Francisco Class A buildings at considerable length, but such a discussion is beyond the purpose of this article. Of about twenty Class A structures all are now rapidly reaching complete re-establishment, and they are furnishing for the new San Francisco a nucleus of life in the heart of the old City.

CLASS A BUILDINGS IN SAN FRANCISCO.

NAME OF BUILDING.	Stories.	Approximate area.	Front walls. Lower.	Front walls. Upper.	Columns.	Floors.	Ceilings.	Column Protection.	Partitions.
Alexander Hotel	11	4,700	S. S.	S. S.	Channels	Concrete	Metal lath	Metal lath	Metal lath
Alto	8	1,500	B.	B.	"	"	" "	" "	" "
Aronson	10	9,350	S. S.	B. & T. C.	"	"	None	T. C.	T. C.
Atlas	10	2,700	B.	B.	"	"	Metal lath	Metal lath	Metal lath
Bullock & Jones	8	4,000	T. C.	T. C.	"	"	None	T. C.	" "
Claus Spreckels	19	5,600	S. S.	S. S.	Z-bars	"	Metal lath	T. C.	T. C.
Fairmont Hotel	6	66,000	G.	T. C.	Channels	"	" "	Metal lath	Metal lath
Grant	8	5,500	T. C.	T. C.	"	"	" "	T. C.	T. C.
Hamilton Hotel	12	3,100	S. S.	S. S.	"	"	" "	Metal lath	Metal lath
James Flood	11	40,000	S. S.	S. S.	Z-bars	Tile	" "	B. & T. C.	T. C.
Kohl	11	9,000	S. S.	S. S.	Channels	Concrete	" "	Metal lath	Metal lath
Marston	8	1,200	B. & T. C.	B. & T. C.	"	"		Concrete	
Merchants Exchange	14	25,000	G.	B.	Pl. & angles	"	Metal lath	Metal lath	Metal lath
Monadnock	10	18,000	B.	B.	Channels	"	" "	" "	" "
Mutual Savings Bank	12	5,000	S. S.	S. S.	Z-bars	"	" "	" "	" "
New Chronicle	16	5,600	B.	B.	Pl. & angles	Tile	Tile	T. C.	T. C.
Rialto	9	16,000	T. C.	B. & T. C.	Channels	Concrete	Metal lath	Metal lath	T. C.
Ruef	8	1,000			"	"			
Shreve	11	9,000	S. S.	S. S.	Z-bars	"	Metal lath	Concrete & T. C.	T. C.
St. Francis Hotel	14	22,000	S. S.	S. S.	"	"	" "	" "	T. C.
Telephone Co.	8	2,500	B.	B.	Channels	"	" "	Metal lath	Metal lath

After the fire, for several months, business was diverted to Fillmore street, and then to temporary quarters on Van Ness avenue. It was believed by some that the centre of business activity would permanently remain near Van Ness avenue, but there is now every indication that the City's life will return completely to the old stands.

Among the repaired structures in the heart of the business district, one finds deep excavations. These excavations are seen on every hand, and in combination with scarred streets, give to the passing eye a notion of disorder. Careful observation, however, will show that these excavations contain pretentious foundations, already completed, and ready for large superstructures. Foundations, in building, commonly consume time, due to difficulties naturally presented. Since many large ones for new buildings of Class A construction have been completed during the past six months, it is safe to predict that the next half-year will bring to view a much more substantial evidence of reconstruction. Before July, steel skeletons will be rising on every hand.

One of the most notable of the new structures in San Francisco is the Humboldt Savings Bank. Its foundations were laid after the fire, and today, its steel frame is completed, with a large part of the reinforced concrete walls and floors already enveloping the frame. The building occupies a lot on the south side of Market street, about 100 ft. east of Fourth street. On Market street the front rises 17 stories, with two additional stories in the dome. The rear portion of the building is 13 stories high. In plan the structure measures 50 by 170 ft. This building represents, in my judgment, one of the soundest forms of first-class construction, in that it typifies a building with a unified steel frame, to which frame are substantially anchored curtain-walls, floors, and partitions of material of integrity like reinforced concrete, capable of remaining intact under severe vibration.

Another building worthy of special mention is the Whittell building. The foundations of this structure were in place in February, 1906, and the steel frame was completed a few days before the earthquake. The Whittell is situated on the north line of Geary street, about 80 ft. east of Stockton street. The structure rises to a height of 17 stories. The curtain-walls are of brick, and the floors of reinforced concrete. The structure contains many ingenious and substantial features, notably in the foundation and spandrel girders, which make it capable of withstanding earth vibration.

Having been started earlier than the Humboldt Savings Bank it is much nearer completion, the curtain-walls being in place nearly to the top of the structure.

Many other steel-frame buildings of similar proportions are rapidly developing, and will be substantially completed within the next twelve months. The new Palace hotel and the wing to the St. Francis hotel are well known examples.

The most striking feature, however, of San Francisco's reconstruction is the advent of reinforced concrete. This type of construction is being introduced to an extreme degree, so that one might almost dub it a fad in San Francisco. There were practically no reinforced concrete structures in the City before the fire; certainly there was no true reinforced concrete building, because of the successful objection and opposition of some of the building trades, which strenuously and consistently opposed the introduction of reinforced concrete as a substitute for brick-work.

The little reinforced concrete construction in existence prior to the fire was mainly found in floors and interior columns. It is well known that floors and interior columns, irrespective of the particular materials of which they were built, suffered very little through earthquake vibration. Such parts of building-frames in general were not subjected to severe earthquake stress or destruction. Consequently, nothing definite can be stated regarding the earthquake resistance of this type of construction.

There were a number of reinforced concrete buildings within the Bay region of San Francisco that were not subjected to subsequent fire; and all evidence in these cases, though extremely restricted, is decidedly favorable to this type of construction as being able to withstand earthquake motion for structures of limited height. This evidence, together with the natural integrity and coherence exhibited by reinforced concrete, has brought it prominently to the attention of builders, and today one may see structures of this class being erected on every

hand. In fact, one might refer to the reconstruction of San Francisco as an era of reinforced concrete.

There is no question in my mind but that reinforced concrete with proper design, materials, and workmanship, will produce a most excellent building. On the other hand, it should be equally observed that no type of construction lends itself more readily to the abuses of the quack and the self-advertised expert. One may find in San Francisco today buildings of reinforced concrete of many types in process of construction; the different examples involving every conceivable patented device, or employing every possible principle of design. Some of these schemes are good, others are decidedly bad. Of the systems of design, some are based on sound principles of mechanics and embody intelligent treatment of details; others are quack constructions pure and simple.

During the past six months, reinforced concrete structures have collapsed in different parts of the country, notably at Long Beach, California, and at Rochester, New York. It would not be surprising to note in the near future the collapse of some reinforced concrete structures in San Francisco. With no other type of construction can a good design be made of no avail more easily than with reinforced concrete, where poor materials are used, with careless or pernicious workmanship.

Because of these disadvantages, however, one should not decry the use of reinforced concrete. It should be encouraged to the greatest extent, but should be carefully supervised, both in the design office and in the field. Reinforced concrete is suitable for many purposes, and has many possibilities of most desirable application, and it certainly has its place in an earthquake country. It would be very unfortunate if quack design and careless construction should injure its reputation in San Francisco. However, I do not advocate the use of it for skyscrapers, but would prefer for the highest buildings a structural steel skeleton; this skeleton might be clothed in reinforced concrete or in masonry work properly reinforced, and anchored to the steel frame.

Immediately after the fire, the building ordinance was revised, as well it might be. The old ordinance, while it was spoken of as a building law, was really composed of 17 different and sometimes conflicting enactments of the Board of Supervisors, made at different times during the last ten years. Of course it was full of conflicting conditions, and was also open to the criticism that it was indefinite and of poor arrangement. While the present building law may be readily criticized, it is a vast improvement upon the old ordinance. It naturally cannot be perfect; no such instrument ever could be. It has many defects and contains a number of clauses that should be changed as soon as possible. Anyone remembering the circumstances and pressure, however, under which the new ordinance was arranged, will have considerable respect for the authors of the law, for it is based on sound practice and good scientific judgment.

For political or business reasons, some clauses were introduced into the ordinance that were not advocated by the engineering advisors; such, for instance, is the clause limiting the height of Class A buildings to one and one-half times the width of the street. Class A buildings have proved themselves perfectly safe against earth vibrations and the best kind of retardents to the spread of conflagrations. There is no reason for limiting their height. The origin of this clause came from a desire to force property owners to widen some of the important but narrow business streets, such as Montgomery. The height-limit clause having failed to produce the desired effect, it has just been repealed.

One of the most unfortunate conditions affecting building in San Francisco is the lack of sufficient inspection on the part of the building department. A building law can never be a specification. It should be as terse and to the point as possible without treating details, and have for its object the protection of the City and general public against persons who want to build too poorly. The building ordinance should provide penalties if it is broken. While an ordinance partakes of the nature of a specification, it should only do so as far as it is necessary to elucidate some of its provisions. As a law, the ordinance tells what shall be done; and in order that its provisions may be enforced, it, in some cases, tells how the work shall be done. It is the function of a specification to tell how to do a thing. The sole and vital reason for the existence of an ordinance, however, is merely to tell what to do. What is needed in San Francisco is not a revised ordinance with greater detail of specification, but rather the present ordinance with a few modifications, and, if possible, greater brevity, coupled with an efficient building department commanding the services of properly trained inspectors.

HIGH CLASS BRICK WORK.—The difficulty that the wreckers are having in razing the Palace hotel in San Francisco does not bear out the reports which are so freely circulated concerning inferior construction in that city. Most people who have traveled know the Palace hotel. It was seven stories high, 300 by 225 ft., and was built in 1870. The bricks were laid in a mortar composed of lime and cement, with strips of Norway iron and steel cables at frequent intervals. The mortar is too hard to be scattered by the cleaning machines. The supports include 100 pillars weighing seven tons each. The walls are first dynamited and then pulled down by hoisting engines — 1½-in. steel cables — equivalent to the strength of 10,000 men. Notwithstanding this, the strips of wall remain unbroken on the ground and require picks and sledges to loosen the bricks. The laborers working below the surface are frequently compelled to desist because of fire which is uncovered. In many places the combination of wood, plaster, and mortar has formed a sort of charcoal, which, secluded from air by piles of debris, has been smoldering ever since the fire on April 18. Boiling water or steam is often found in these places. The crowds of laborers are constantly on the alert to avoid being burned or scalded. There are 10,000,000 brick in the building, and the debris will fill 80,000 wagons. The contractor is receiving $30,000 for wrecking the building, and the value of the salvage is estimated at $20,000.—*Construction News.*

PROGRESS ON THE PENNSYLVANIA TUNNELS.—Work on the Pennsylvania Railroad's New York terminal and tunnels is going forward with great rapidity. A large portion of the tunneling is actually completed. There has been another meeting of tunnels—this time in Long Island City. The southern-most of the four tubes being driven from East avenue under the Long Island Railroad passenger terminal toward the East river has reached the river shaft and is now connected with the tubes that go out under the water. Recently the headings bound in opposite directions under Thirty-second street, Manhattan, came together nearly under Third avenue, so that there are continuous passages from the East river to Fifth avenue under both Thirty-second and Thirty-third streets. Under the East river the cast-iron tubes, bound in both directions, have gone about 500 yd. Those going east from Manhattan, having started a full year earlier, are more advanced. The three to the south, known as *B*, *C*, and *D*, are now piercing the rock of Blackwell's Island reef. The tubes bound from the Long Island City side toward Manhattan are about 350 ft. out under the water.

A Question of Mining Law.

A correspondent submits the following case:

A and *B* have a law-suit over a claim in 1905. Neither of them do any work in that year (1905). *B* wins the suit, but does not do his annual work in 1906, claiming that the land office excused him from doing his annual work in 1905. Consequently the claim would not be open for location until January 1, 1907. But *C* makes a location on December 25, 1906, and *B* locates the property on January 1, 1907, in other parties' names. Was the claim open for location in 1906, and does *C* have the 60 days to record and do a ten-foot hole, even though it takes some time in 1907? Who would be the valid locator?

Our reply is as follows:

As between *A* and *B*, neither might have been permitted to take advantage of the other's failure to perform the work during the pendency of the litigation. As against *C*, the excuse of non-performance by *B* during the year 1905, would be available only upon showing that he had been prevented from doing the work by force, or violence, actual or threatened. The question implies that at some point of time in 1905 the litigation was finally terminated in *B*'s favor and that thereafter and prior to January 1, 1906, he had the opportunity of doing work, or at least he might have resumed work on January 1, 1906, and saved the location from liability to forfeiture. As he did not do so, the ground became subject to re-location on that date and was so subject on December 25, 1906, when *C* entered and initiated his right. *C* would be allowed the same time to complete his location as if he were an original locator. The fact that this period of 60 days extended into 1907 is of no moment. It is possible that *B* might have resumed work on January 1, 1907, and thus prevented the re-location of *C* becoming effectual, if on that date *C* had not completed his location by complying with the State law. As to this the decisions are not harmonious. But as *B* did not resume work, but sought to re-locate through others within the 60 days allowed *C* to complete his location, *B*'s rights must yield to *C*, whose re-location would become effectual upon completion of the statutory work and recording his certificate. Timely resumption of work may intercept and cut off rights initiated but not perfected, but an adverse re-location made before the expiration of the 60-day period cannot have this effect.

THE NORTH STAR MINE.—During the year ending December 31, 1906, the North Star mine, at Grass Valley, in Nevada county, California, produced a total value of $826,326, at a cost for current operation of $392,445, and an operating profit of $433,881, from which additional costs were paid for general Mine Development, amounting to $122,822, thus leaving an available mining profit, over both operating and development costs, of $311,059. Outlays during the year for Improvements, $27,561; Property Purchase, $2,171, and Sundries (Accident Fund), $1,424, mostly chargeable to Capital account, amount to $31,157, resulting in a cash remainder of $279,901. Out of this sum there were paid dividends amounting to $250,000, 10% on the issued capital stock, leaving a net surplus of $29,901 still available for dividend account. The above stated total value was wholly produced from the North Star mine during 1906, and was obtained from 84,672 tons of ore, milled with an average yield of $9.75 per ton, at an average operating cost of $4.63, with resulting profit of $5.12 per ton, less additional outlays of $1.45 per ton for development work. The above stated costs of operation and development amount altogether to $6.08 and leave a realized profit of $3.674 per ton. Outlays during the year for Improvements, Property Purchase, and Sundries amount, per ton, to $0.368, leaving a net cash surplus of $3.306 per ton (about one-third of the realized value of the ore), available for dividends.

Making the Best of the Ruins.

DURING the conflagration of a year ago, the quarters of Chas. C. Moore & Co., engineers at First and Mission streets, were burned, leaving only the foundations and the upright cast-iron columns of the outer walls, which were badly cracked by heat, but were repaired so as to form the nucleus of the present building. This, it will be noticed, consists of a two-story frame structure, with the original brick walls repaired. The ground was covered with melted iron, lead, zinc, and copper remaining from the destruction of the large stock of machinery on hand. This mass of metal had to be blasted before the site could be cleared. This building was completed and occupied by September 6, 1906. Contracts secured by this firm since the fire include a complete electric plant for the Pacific Light & Power Co., a total of 15,000 kw.; city of Pasadena, complete electric plant; Fairmont Hotel, and Johnson Bdg., electric lighting engines; complete 60-stamp mill and cyanide plant for the Tonopah Development M. Co., and other mining companies.

Reinforced Concrete Construction.

Written for the MINING AND SCIENTIFIC PRESS by LEWIS A. HICKS.

The use of reinforced concrete for buildings in San Francisco has been wisely limited by the building ordinance to eight-story structures. Where greater height is desired resort must be had to a steel frame of cage construction, which may be clothed with six-inch curtain-walls of reinforced concrete and stiffened by the usual fire-proofing and slab-floor construction of the same material now recognized to be the best available method of building floors for steel buildings.

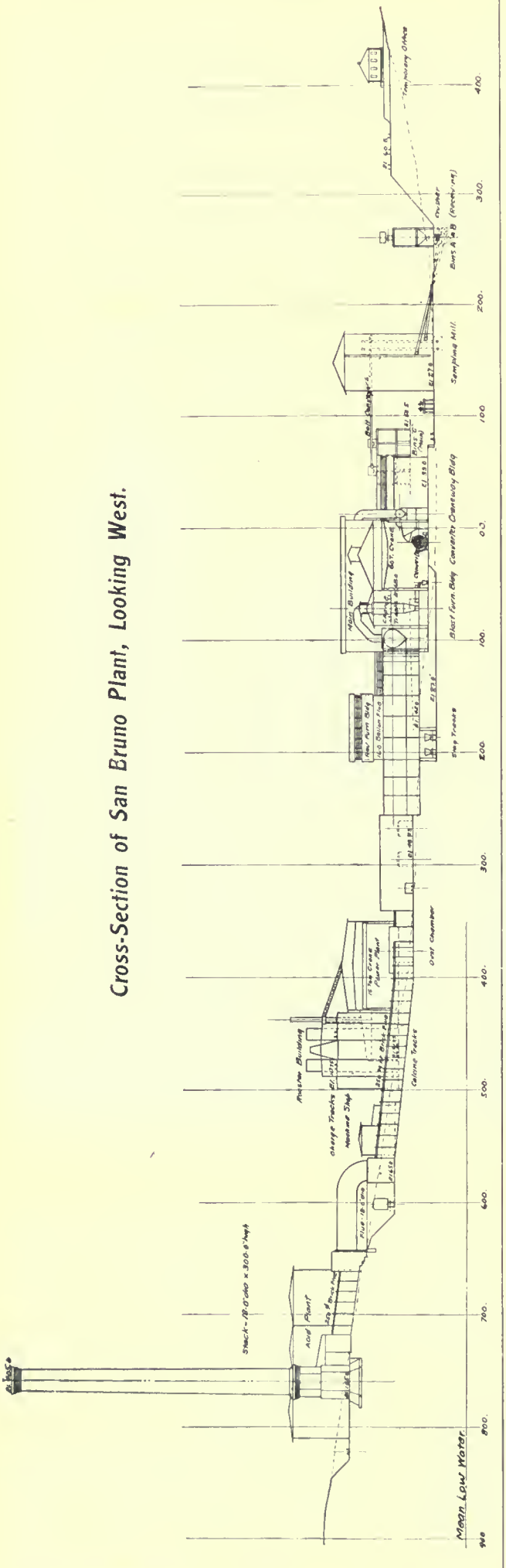
Before the earthquake, the efforts of those interested in introducing this comparatively new material had been abortive owing to the active resistance of persons interested in the manufacture of clay products, the opposition of the bricklayers unions, and the general inertia of the building trades to accept changes in long established methods of construction. When the pressure of this conservatism was removed by the conditions following the fire, there was a prompt reaction in the public mind in favor of the indiscriminate use of a material that would furnish greater security against damage by earthquake and fire than the brick construction formerly prevailing, and without entailing the excessive cost of a steel frame. For a time it seemed as if every building put up was to be made of concrete, but a sufficient interval has now elapsed to make it possible to outline broadly the place in building work that it is well adapted to take, as well as such economic limitations as insure the use of other materials for certain purposes.

It is probable that everyone who has witnessed the destruction done by earthquake and fire to some extent shared the feeling that the new San Francisco must be built of enduring materials such as would forever prevent the recurrence of such a disaster, but it is now apparent that in the struggle to maintain down-town property values the character of the improvements must be largely determined by the ability of the owners to pay for them.

The ground floor of any building used for business property produces revenue disproportionately large to that earned by other floors. Where ground-values are high and owners do not have the funds in hand to make improvements bearing an economic relation to the value of the site, it often happens that the rentals from a low two or three-story building of the cheapest type will return a reasonable interest on the cost of such improvements, and maintain intact a high ground-value until such time as appreciation justifies an extremely high building. Where this solution of an owner's problem is adopted, it is apparent that the cheapest construction, satisfying the requirements of the City ordinances and the reasonable demands of the lessees, should be used. It will be found that this is best and most quickly secured by the use of brick walls with interior wood construction for posts, girders, joists, and partition walls.

When money is available, and the locality affords commercial use for high buildings, approximating in cost the value of the land on which they stand, all considerations seem to combine to suggest a steel frame. Ordinance limitations, tested security, certainty of the continuity of rentals, and permanence of the investment appeal to the owner who has money available to take

Corner of Market and Kearney Streets.



Cross-Section of San Bruno Plant, Looking West.

advantage of extremely high buildings, which can yield revenue from additional stories disproportionate to the rest of the structure, because owing to the fixed land value the total cost does not increase proportionately with the earning power.

Between these two extremes there are a large number of people owning valuable street-frontage with deep lots who must soon find some commercial use for their property and who desire fairly permanent improvements of moderate height but of Class A character. It is among such that reinforced concrete will find its most extended use.

An eight-story office-building having large ground-area properly situated to secure tenancy can be operated more profitably than a narrow tall building with the same floor-space. The property on the south side of Market street between First and Seventh streets, although held at high frontage-values, has such great depth that it is peculiarly adapted to permit the profitable combination of the necessary factors of availability, large ground-area and relatively low buildings of moderate cost and permanent character.

These requisite conditions are most successfully fulfilled by a building with reinforced concrete frame-floors, roof, and curtain-walls, with its front veneered with stone, brick, or terra cotta bonded into concrete backing and all its structural members fire-proofed with a secondary skin of metal furring and plaster furnishing protected air-space. Such a building is Class A in every detail of construction and in appearence, and in its virtual power to resist fire and earthquake it is, in my opinion, within the limit of height considered, equally as reliable as a steel-frame structure.

The amount of concrete used in fire-proofing the columns, beams, floor, and roof of a modern steel building is practically sufficient to build the same members in reinforced concrete, and the difference in cost of the two structures will be roughly the difference in the weight of steel used. The elimination of two-thirds to three-quarters of the steel required for a steel frame is entirely practicable, but the saving is not as significant as would appear at first glance. The cost of a finished Class A structure will range from four to six times the cost of the steel frame and the saving effected will therefore amount to from 10 to 15% of the cost of the improvements.

Where the relation between the value of the ground and the cost of the building is normal, or as one to one, there follows that the saving on the entire investment amounts to from five to seven per cent. It will frequently happen that an owner will prefer to pay this additional cost for the sake of having a type of construction that has been tested to a finality. It is also true that in incompetent hands this apparent saving of five per cent may easily shrink to disappearance, and that time, apparently in favor of the concrete type, may be wasted to such an extent that the steel frame will gain rather than lose by such a comparison.

On the other hand natural advantages favor the concrete frame. The steel required can be secured from local stock and the other materials are of local origin. There has been heretofore very little shop-work in concrete construction analogous to fabrication work in steel manufacture, but we are now having the columns and beam-forms for an eight-story concrete building manufactured in a planing mill from shop details similar in every respect to that provided in steel shops. The forms are lettered and numbered and delivered to the job where they will be erected from a setting plan with a derrick having a boom long enough to pick the material up from the street and set it in any part of the structure. With proper apparatus and methods it is evident that the com-

pletion of a concrete frame should not require more time than the erection and fire-proofing of a steel frame.

We erected the last four stories of the Corder building at Thirteenth and Franklin streets, at Oakland, in five weeks, including the wall enclosure; this is a record that can hardly be bettered. Under these circumstances the time required to fabricate and ship a steel frame from the East, involving a minimum of two to four months, can be saved, but as a portion of this period must be used in back, to the writer's detail, into which the concrete backing clinches, holding each brick separately. The brick is laid to a line in the usual manner; it is then breasted with timber and backed up, and the resulting construction is integrally a whole and practically monolithic. The projections of the terra cotta sections are also filled solid with concrete.

In addition to the field of usefulness pointed out there is a wide opportunity for reinforced concrete to displace

The Bay of San Francisco.

Showing position of new copper smelter in relation to neighboring towns.

either case to prepare foundations, the saving in time will not be important.

I do not believe it possible to secure satisfactory architectural exteriors in cement, but I consider that the backing up of finish clay-products with a reinforced concrete curtain-wall is the only method yet devised successfully to protect the facing material from earthquake distortion. The building occupied by the Breuner Furniture Co. in Oakland is faced with pressed brick and terra cotta backed with six inches of concrete. The brick were manufactured with a dovetail slot at the slow-burning mill-construction in factory and loft buildings where heavy floor-loads make it especially desirable. No material ever introduced has so quickly made its way into general use and its useful application is apparently to find examples in every branch of construction.

ON THIS PAGE we give a map showing the exact position of the copper smelter being built by the Selby Smelting & Lead Co. On the page opposite will be found a cross-section of the works.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE production of gold in Nova Scotia in 1906 was 14,000 oz., or about 1,000 oz. less than in 1905.

CONSULATE REPORTS state that 233,598 tons of freight left Mexico for the United States in 1906, going by the all-rail routes.

THE slope of the vanner is generally from three to five inches in 12 ft. When a corrugated belt is used the inclination is greater than with a smooth belt.

A MINING COMPANY incorporated under the laws of Arizona, and having its certificates marked "not subject to assessment," can not levy an assessment legally.

THE Calumet & Hecla lode consists of a bed of conglomerate 12 to 25 ft. wide, in which the copper occurs as native metal, the average yield being about 2½ per cent. The hanging wall is a fine-grained diabase.

MUNTZ metal amalgamating plates are used in the Thames district of New Zealand. They absorb but little amalgam, and can be cleaned of amalgam without the use of steel scrapers, and are therefore advantageous in custom mills.

FOR amalgamating plates, only the purest and softest annealed Lake Superior or electrolytic copper should be used. Annealing is necessary to soften the hard skin formed by rolling and to make the copper porous for receiving the mercury.

THE number of vibrations recommended for Frue vanners is 180 to 200 per minute. For end-shake vanners, the number ranges from 200 to 240. The amount of vibration is generally one inch in all the standard side-shake vanners.

ESTUARINE CLAYS are laid down in shallow arms of the sea. They often show sandy laminations, and are not infrequently associated with shore marshes, due to the gradual filling up of the estuary, and the growth of plants on the mud flats thus formed.

THE steam-stamps used in the Lake Superior region crush from 700 to 750 tons per day. A single stamp, of the compound type, has been known to crush 779 tons in one day. The consumption of water is enormous, from 3,000,000 to 3,500,000 gal. per head per 24 hours.

IN running vanners it is necessary to consider the size and uniformity of size of the feed, the vibrations, rate of travel, slope, quantity of water, and the depth of the pulp bed. There should be no jarring or knocking, no loose joints, and no movement in the foundation, if the best results are to be obtained.

WHEN rocks are subjected to simple pressure and the dynamic movement is chiefly between molecules, the process is called 'static metamorphism;' but where they are subjected to movement and deformation, the process is 'dynamic metamorphism.' There are many gradations between the two, and neither one acts entirely alone.

THE slope of amalgamating plates is a very important adjustment in gold milling. If they are set at too steep an angle, the pulp rushes over them too rapidly and the gold and amalgam have less opportunity to settle and adhere, and the amalgamated surface will be scoured off. If they are not steep enough, sulphides will stick to the plates and reduce their working area. The plates should be perfectly level transversely.

AN excellent flooring, proof against damp and insects, is made by melting in an iron pot 100 parts of asphalt, and one of tar; sand or stone-breaker screening may be added in the proportion of one to four. The surface to be asphalted must be dry, and may be covered with stone chips or screening. It is divided by thin straight edges, set level and well greased. A floor one inch thick requires 12½ lb. of asphalt per square foot.

NOT many mines have been found by geologists, but one of them is the Champion copper mine in Michigan. The rich lode traversing this property was discovered by Dr. L. L. Hubbard, formerly State Geologist of Michigan. He identified the lode as an extension of the Kearsarge amygdaloid bed, and determined its position by geological evidence. Since then the Champion has become one of the richest mines in the Lake Superior copper region.

THE advantage of mounting a machine-drill on a cross-bar instead of on a vertical post, is that, in driving, the machine can be set up and started running while the muckers are taking care of the rock shot down with the last round of holes. If a post were used, it would be necessary to muck out at the foot of the post, clear down to the floor, before the machine could be securely placed in position. When drilling on a bar, the back and breast holes are put in first, and by the time the machine has to be swung under the bar for the lifters, the rock underfoot has all been removed.

THE patent survey of a placer claim is much the same as that of a lode claim, except that it is not limited to such a great extent. The claim must lie within the location boundaries, its lines can not lap over other claims, all known lodes must be excluded, and the deputy must submit under oath to the Surveyor-General's office a description of the soil, vegetation, etc., on the ground included within the placer claim. Two disinterested persons are necessary to make a corroborative affidavit. When placer ground is patented by legal subdivision, no survey is necessary, but a descriptive report must be made.

THE cradle or rocker that was used to a great extent in some placer districts, is a box about 40 in. long and 20 in. wide, mounted on transverse rockers, and having the front end open and the back end closed. The sides slope up from the front toward the back to a height of 12 to 20 in. A screen box 20 in. square and 6 in. deep, having a perforated screen with half-inch holes, is set on top at the back end. Beneath this is a backward-sloping baffle board, or an apron made of canvas or blanket. On the bottom of the cradle are two riffle cleats, about three-quarters of an inch high, one near the middle, and one near the lower end.

A VANNER does its work of concentration on the surface of an endless belt, which is slightly inclined from the horizontal, and receives a rapid shake in the plane of the belt, while at the same time it has a continuous, slow motion up the slope. This agitation, under a film of water, makes the bed so loose that minerals of high specific gravity can settle to the belt, where they have a tendency to stick to the surface, while those of lower specific gravity rise to the upper layer. The travel of the belt carries the heavy mineral over the upper end, where it is washed off, and the surface water washes the light material over the lower end.

Requirements of Modern Mining.

Written for the MINING AND SCIENTIFIC PRESS
By J. R. FINLAY.

The trade journals have entered up the business records of 1906, and the showing in all directions is remarkable. Everybody knows something of the wonderful growth of the mining industry, but few perhaps realize what it amounts to. Without having statistics at hand, I remember that the figures compiled by the U. S. Geological Survey, show that in 1880 the total mineral output of the United States was valued at $370,000,000, and that in 1905 it was $1,677,000,000, an increase of $1,300,000,000 in 25 years; an annual increase averaging $52,000,000. These stupendous amounts, and this swift increase, not only attract the imagination, but they also lead to the practical conclusion that the product of mines is being absorbed by civilization with startling rapidity, so that the question to be asked is not where the market is coming from, but where the supply is coming from. The world's consumption of coal, for instance, is over a billion tons per year, sufficient to make a pile for market five miles square and 60 ft. high; and this enormous consumption is rapidly increasing. This demand has nearly all grown up in two generations. What will be the result in two generations more? Long before the problem shall be reached of securing the last vestige of the world's coal, commerce will have to face the fact that the vast increase of fuel demands cannot be met. If fuel is to become scarce and costly, as recent experience in the Western States shows is liable to happen only too easily even now, what about the problem of producing a greatly increased amount of iron and other metals from less and less favorable ores that will require more and more fuel for smelting?

But neglecting questions that must become vital with our immediate descendants, it is interesting to consider the vast extent and variety of the mining industry as it stands today. The field is so great that it permits only of specialists. Does any one man know, in a practical way, the mode of occurrence of most of the valuable minerals? Does he know coal, iron, copper, gold, silver, lead, zinc, cement, precious stones, as they occur in the earth? If he does, can he possibly know the processes required to get them to the surface, and put them in marketable form? If he knows this, can he possibly know how to market them? If he knows all these things, will he then know how to finance and launch enterprises to exploit them?

We call a man a mining engineer if he can make an underground survey; a mining man if he owns some stock in a prospect. From these crude beginnings the experience of many individuals makes great advances, but it seems incredible that any intellect, or any energy, would be sufficient to get more than a thin comprehension of the vast subject.

I used to think I would be quite a mining man when I reached the position of superintendent of a property. Later I found that achievement to mean little. Success in handling one mine may be due to some quality that may be next to useless in the next one. At the first mine a man may need only operating talent—capacity to organize and get work out of men. At another, such ability may be absolutely unavailing, unless it be joined with intelligence and training in finding ore. As a man's experience in mining widens, he is constantly reproaching himself for want of knowledge on essential portions of the business, until he finally consoles himself with the reflection that if he had learned the things he doesn't know, he might on that account remain ignorant of the things he does know. At best, one's brain and one's opportunity have their limitations, and it does not take an intelligent man many years to convince himself that pretension to know the whole mining business can be nothing but a fraud, and the expectation to do so only a delusion. Nevertheless, if one may cover the requirements in the case of one or two metals, his equipment will be abundant to secure him his 'shoes and tobacco;' and it may be of interest to discuss what these requirements are. I venture the following generalization:

The business of mining involves

1. Ore and mineral deposits.
2. Operation of mines.
3. Processes to render mineral products marketable.
4. Marketing.
5. Financing and organization of enterprises.

The first division is entirely in the realm of natural phenomena and facts. The second and third deal partly with nature in the materials to be handled, and partly with man in the handling of them. The fourth and fifth divisions are wholly matters of human dealings. It is rather painful to the striving engineer, after laboring over the science and technology of his profession, to find that after all he has been working on a small part of his business, and that the least important. In its broad aspects mining is far more of a question of human relations and facts, than of natural relations and facts.

Now it may be objected that this generalization is either self-evident or meaningless. I shall give an illustration to show how all these considerations must be weighed in the commonest problems of mine operation. At Joplin, Missouri, the ore consists of pieces of singularly pure galena and blende, distributed unevenly through the rock. If these ores could be sorted by hand, it would be easy to pick out stuff running from 30 to 60, or 70% in zinc or lead. Naturally it would be desirable to do this, instead of crushing the beautiful crystals in a mill, and thereby losing 20 to 50% of them. Why not do it? Simply because the market conditions at Joplin do not allow it. Local practice, too strongly intrenched for the small operator to interfere with, and doubtless founded upon good reason, dictates that a zinc ore must be cleaned until it carries about 60% zinc. Failure to bring the ore up to this grade is penalized so severely as to wipe out any possible profits in saving mill costs and losses by hand-sorting. It is obviously impossible to depend on hand-sorting to produce from a low-grade mixture an ore that will conform to a rigid standard of value.

Here we see the human condition of marketing reacting imperiously on the method of mining. It makes a mill necessary, where under a different market it might often not be necessary. It throws the industry into a certain channel, out of which the operator cannot go without meeting certain failure. This consideration influences the view one must take of the value of a deposit, the method of mining, the requirements of milling, and, consequent on all these, the financing of a project.

In the Rocky Mountain region the smelter imposes no conditions except a freight and treatment charge, varying within modest limits according to the grade and composition of the ore. Here the question of what it is wise to spend on mining and sorting on the one hand, and how much to lose in a mill and how much to pay for freight and treatment, on the other, is a very broad one. It may be capable of many solutions, each of which may mean a different result in dollars and cents.

A gentleman in charge of a large and valuable group of silver-lead mines announced the other day, with breathless triumph, "I have raised my mining costs 10%, raised the grade of my ore 25%, and increased my profits 100%, and, do you know, my directors are kicking about my high costs!" I submit that in this case millions of dol-

lars in mine valuation depend upon a trick of mine operating. What a different view one would take of the property before and after the determination of the above results!

In like manner we hear of important interests in coal mining being rendered dangerous as investments, because the railroads will not furnish cars. Here the question is apt to be, not what kind of a mine have you, but, what are your relations with the railroad?

It is probably true that in the majority of cases the determination of trade and finance questions is left to specialists in those lines. Indeed, in any event, there must be questions of this kind that are as inherently the work of specialists as the work of an assayer or a machine-runner. My point is, that the mine manager or the mine valuer must be broad enough to recognize the fact that the man who sells ore, or buys ore, or promotes a scheme of mining enterprise, has just as much claim for recognition as a factor in the business as the mine superintendent or the metallurgical engineer. Perhaps far more. Reflect, that the men who now control the greatest enterprises are not mining engineers; they did not even begin as mine owners; they were business men whose business was refining oil and selling it, or financing smelting enterprises; they were men whose wits were sharpened by competition. There is no competition in the ownership of a bonanza mine. The owners are generally spoiled by having too much of a snap; they have not, as a rule, expanded to the true requirements of their business, and while hugging themselves for their successes, they are really stagnating in a small corner of the field.

Much has been written about mine valuation, and mostly with a failure to recognize the full scope of the subject. Everyone knows that to take samples and measure the ore in reserve by some fixed rule, requires no more than honesty, care, and some knowledge of solid geometry. That does not go far. The mine remains, and new ore is found after the ore once in reserve is gone. The geologist may go further and arrive at a correct conception of the persistence and extent of the mineralization, but does he know what the ore can be mined for? In many cases he does not know. The foundation is laid, let us say, that a million tons of ore may be relied on, carrying a certain amount of various metals. Still the valuation is only begun. The great problems remain of how it can be mined, how milled, how smelted, and how marketed at the maximum profit; and how may an enterprise be organized and financed so as to realize the maximum profit for the investor. I contend that the answering of these questions is by far the greater part of mine valuation. A mine may be a grand success, financed at $10,000,000, and a dreadful failure if financed at $5,000,000. Who will decide this? A man who can operate a mine? One who understands ore deposits? One who can operate a smelter? A man who can sell steel rails or cuff buttons? A man who can furnish the money? None of these. All of them together can perhaps; but very much better a man who can weigh with discrimination the evidence of each.

I venture to say that the men in this country who are able to bring to bear on a gold mine, or a copper mine, or a lead mine, such an equipment, and who have an opportunity to do it, may certainly be counted on the fingers of one hand. If these problems are so complex and far-reaching today, they are sure to be more complex and more far-reaching. What financing and what methods will be required twenty-five years hence, when the world will require several times the amount of mineral products it requires today! It is difficult to imagine, from present knowledge, how such vast demands are to be met. 'Ore in sight' will not meet them. Scientific exploration and development, improved methods, the use of new materials to substitute those now in use, will all help. To do these things is a splendid field for good brains. It is a comfort to know that the business of mining is no fake, but a most essential—and perhaps the most distinctive—part of modern civilization. Many a young man now behind a tramcar, or a drilling machine, thinks mining a pretty tough business. So it is. So is war also a tough business. If war has produced the greatest reputations, mining has produced the greatest fortunes of the world; and in both there is room for future Napoleons.

Ore Deposits Formed at Shallow Depth.

In the Cordilleran regions, as well as elsewhere in the world, veins containing gold with much silver, and, more subordinately, lead, zinc, and copper, are found in flows of volcanic origin. In many cases the geological conditions enable us to say with considerable certainty that these deposits have been formed at a relatively slight depth below the surface, say, from a few hundred to 5,000 ft. below the actual surface of the ground, at the time of mineral deposition. Among these are, for instance, most of the veins of western Nevada, the San Juan region of Colorado, Cripple Creek, and a great many ore deposits of Mexico. These deposits are closely related to the sericitic and calcitic veins formed at greater depths. An unbroken line of transition between them may in fact be found, but at the same time veins formed at slight depth possess certain characteristics of their own.

Gold and silver prevail, though compared to the deep-seated veins with quartz gangue there is more silver, and the native gold is, as a rule, present in a more finely divided form. Pyrite, galena, zinc-blende, chalcopyrite, arsenopyrite argentite, and stibnite are the prevailing ore-minerals, but more complex sulphides, sulphantimonites and sulpharsenites, such as ruby silver, stephanite, polybasite, are more abundant than in deep-seated veins.

In part their presence may be due to a secondary enrichment by descending solutions, but opinions do not as yet agree regarding all of these occurrences. Of gangue-minerals quartz prevails, but it is here often accompanied by chalcedony, opal or other forms of silica. Calcite and dolomite are moderately abundant in the vein-filling, while siderite occurs more rarely. Barite and fluorite predominate locally. Magnetite and specularite, as well as the whole line of the silicates belonging to the greater depths of formation, are absent. Apatite is of rare occurrence. On the whole, as may be expected near the surface, the filling of open cavities is a process of much importance.

The metasomatic processes differ, in character of course, in different country rocks. In igneous rocks of medium acidity a strong sericitization is apt to take place immediately adjoining the vein with attendant concentration of potassium and leaching of lime, iron, and magnesia. Pyritization is also of common occurrence. The solutions appear on the whole to have been poorer in carbon dioxide than those of the deep-seated deposits and extensive carbonatization is therefore less common. On the other hand, the solutions have a tendency to spread from the veins through large area of adjoining rocks, probably owing to more extensive fissuring near the surface, and here, robbed of their most active ingredients, they produce the so-called 'propylitization,' which consists in the development of chlorite and epidote, as well as pyrite, from the dark silicates, and in the eventual degeneration of the feldspars into quartz, chlorite and epidote.—Waldemar Lindgren in *Economic Geology*.

Mining Labor in Australia.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. LORING.

Volumes could be written on the labor question, but it is not the intention to dwell more than lightly on the subject here. During my five years' residence in Australia as the representative of a firm employing 5,000 men throughout the Commonwealth, I have had the opportunity of making a study of the labor question. My experience is such that I have no hesitation in pronouncing the Australian workman the superior of any with whom I have hitherto had to deal in other parts of the world, and certain it is that with proper supervision his right to the pre-eminent position is indisputable. Let us proceed to analyze the characteristics responsible for this happy state of affairs.

Physically, the Australian will compare favorably with any people in the world. He is a big clean-limbed individual, above the average height, partly attributable, it is claimed, to the love for sports of all kinds. The laws of the country are such that they permit ample time for sports and outdoor recreations. Australia is a country of perpetual sunshine, with physical features that practically demand an athletic life; it is no wonder, therefore, that its people are of a cheerful temperament, and brimful of life and energy. The Government adds to the country's natural charms by the reservation and equipment of innumerable pleasure grounds, thus fostering and encouraging the innate love of sport and outdoor life. Of greater importance still is the Australian's advantage from an educational standpoint. An uneducated person is a *rara avis*, and the country's laws providing for the schooling of their younger population are very stringent. Statistics conclusively prove the Australian's scholastic abilities to be miles ahead of those of any other country. While he is an independent fellow, incapable of being driven, and deeply resentful of anything approaching overbearance, the Australian workingman is one who, with fair and square treatment, can be most easily led and governed.

Primarily, it must be explained that the eight-hour shift is in vogue, and in practice, works admirably. It has been thoroughly demonstrated that the worker, under such conditions shows relatively far superior results to those prevailing under the 10-hour and longer shifts. Many years' experience with American labor working 8, 10, and 12 hours per day has served to make me a strong supporter of the eight-hour shift. In this country the eight-hour system is customary in every trade, and predominates in many classes of business. Roughly, in the neighborhood of 50% of the working population are members of labor unions, and it is regrettable to observe of late years a tendency on the part of these unions to agitate for a lesser number of working hours. An argument put forth by one labor leader was that a shift of six hours would show a corresponding increase in the working ranks, and lay the unemployed ghost for ever. To maintain that mining labor is worked too hard is absurd; no man can do himself serious injury in eight hours, no matter how hard he may work. He has the remaining 16 hours during the day to rest, and usually the whole 24 hours on Sundays. Only in some places, in the case of continuous process plants, are men called upon to work on the Sabbath. Eight hours per day is a fair and reasonable length of time to be on duty, and the reduction of the working hours below that limit would be detrimental to both employer and employee.

Long experience has made me an ardent believer in the old adage, "Good pay for good work." The payment of the highest ruling rates will naturally attract the best workers. The West Australian goldfields may be cited as an example, as the labor there was, until recently, of an infinitely superior standard to that of Broken Hill and its environs, solely owing to the fact of the high wages prevailing. A few weeks back the mines at Broken Hill decided on an all-round increase in wages, and I venture to predict that it will be but a short time when the standard of labor at that great mining centre will be raised to a level that will leave little cause for complaint. The effect of this rise in wages will not only alleviate to an appreciable extent the efficiency of the present worker, but it will act as a magnet in attracting good men from those fields abundantly supplied with labor. It is ridiculous to claim that the West Australian is a better man at his work than the man of Eastern Australia can be if the inducements are sufficiently attractive to warrant him putting forth his best efforts. As a matter of fact, the West Australians have practically all migrated from the Eastern States within the past twelve years, and are but representative of the true Australian. Good pay, capable organization, and close supervision have been the fundamental principles responsible for the happy position occupied by labor in Western Australia today. I maintain that it is more economical to the employer, and extremely beneficial to employer, employee, and the country generally, to pay three men 11s. 8d. per day each, than to give five men 7s. per day each. To my own satisfaction, time and again, I have proved in actual practice the wisdom of such a policy. Of course, were it found that no better results could be obtained from the man receiving 11s. 8d. per day than those derived from the 7s. man, my argument would not hold water; but the higher pay spreads encouragement and contentment among the men, and these are two powerful constituents in the promotion of efficiency.

Most certain it is that the men hold the key to the labor question in their own hands — not by way of strikes, but by the demonstration of their worth to their employer. It is often claimed that the employers do not treat their men properly, with the result that the matter is reported to the union, to the secretary, or to a committee appointed to confer with the employers. At this conference the employees invariably air their grievances in forcible terms, and the employer resents the position as an unwarrantable interference with his business. The causation of bad feeling between both parties is oftentimes the result; and the origin of the whole trouble in four cases out of five will be found to be some trifling difference which should have been amicably settled between the aggrieved parties and their superior officer, at the time without recourse to higher councils. The advisability of the men and employers pulling together is so palpable that it is strange to see the difficulties which are allowed to develop without being nipped in the bud. The average Australian workman is a brainy fellow, and it is a subject of wonder that he does not come to recognize this point.

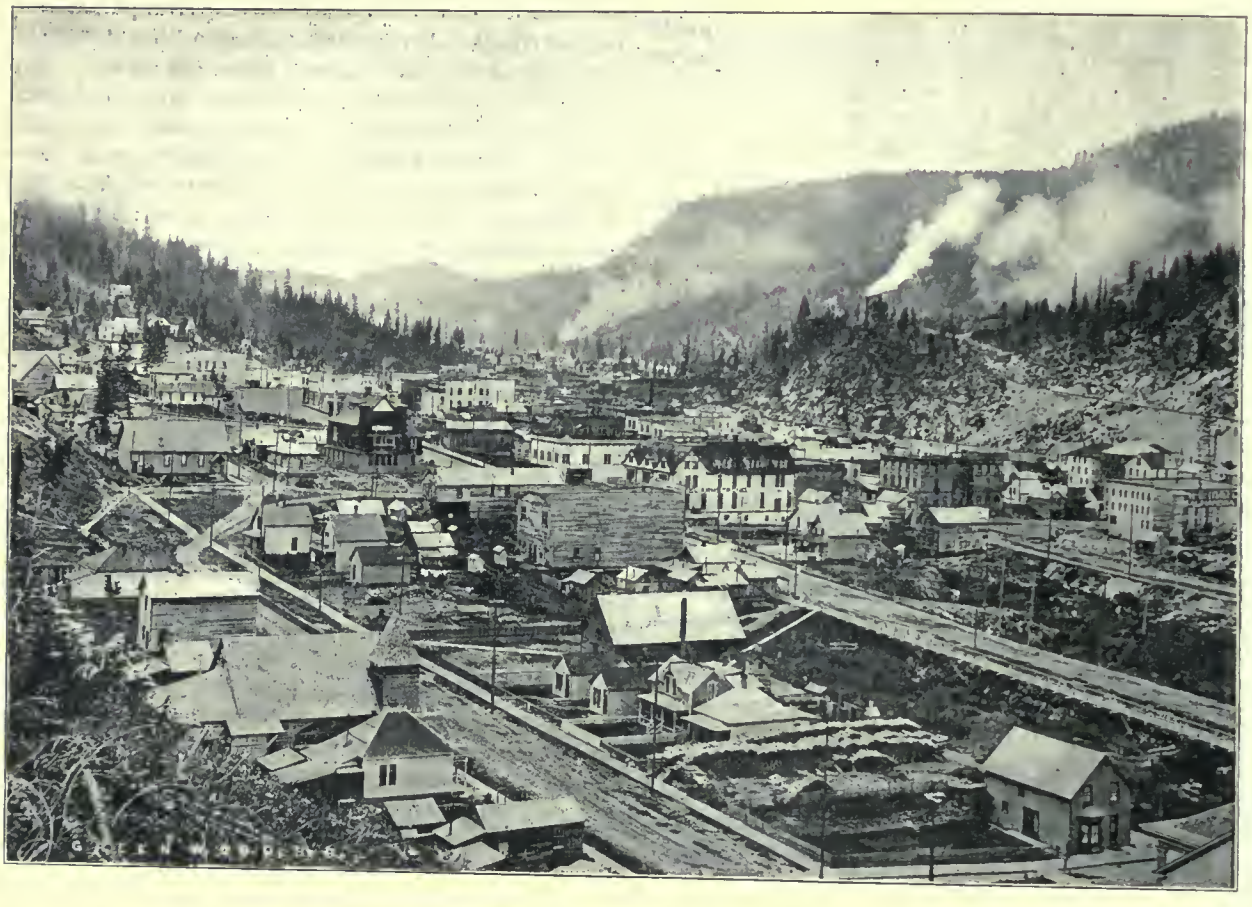
In some instances — particularly in those districts possessing a poor standard of labor — the adoption of the contract system has proved most advantageous. Especially will this apply to underground work. The contract is a boom to the experienced and skillful worker. Through it he is enabled to earn more than the ruling rate by simply exerting his highest endeavors. This method of working also raises the efficiency of the individual and puts him in line for promotion by permitting him to prove his worth to his employers. The effect on the less inefficient worker is also noticeable; he recognizes the goal he can reach by perseverance, and it is an incentive for him to give his employer better results.

Care in the selection of shift-bosses and departmental heads, with a view to the absence of friction, will be found one of the most important characteristics necessary to a perfect working force. Encouragement of initiative and recognition of worth, either by promotion, raise in pay, or reward, are points well worthy of consideration.

Judicious mixing of nationalities has been found advantageous in mines employing a large number of men, but in no instance is it desirable or advisable to allow the percentage of foreigners on the pay-sheet to assume any great proportion. Indeed, great care in this direction is necessary in some quarters to prevent intense friction, and in no country where the English language is spoken should a foreigner be allowed to work underground unless possessed of a working knowledge of English. Many mine accidents in former years can be attributed to this cause, but happily, nowadays, proper attention is given to this factor of safety.

That cheap colored labor is emblematic of low working costs is utterly fallacious. Comparison of the big mines of Australia and America working white labor, with those of the Rand, employing either Kaffir or Chinese, will show footage and tonnage per man in favor of white labor in the ratio of at least four to one. The inference is obvious. The policy of a 'White Australia' is an experiment well worthy of observation. The idea is to exclude all colored races. No person is permitted to land unless able to speak and intelligently write one paragraph of any European language. This language test has solved the Chinese problem, for it is seldom that a Chinaman is able to satisfy the Inspector that his knowledge of English is sufficient to justify his enrollment as a citizen of the Commonwealth. The Japanese, it might be explained, have also to pass this language test to gain admission to the country. One effect of this enactment is the stoppage of the importation of Kanakas to work the sugar plantations of Queensland. Those already here are rapidly being deported to their native lands, and it will be but a short time when the whole of the sugar plantations will be manned by white labor. While this will necessarily increase the cost of production, the Government will undoubtedly offset it by the adjustment of duties on the imported commodity. While it may turn out a bad policy for some parts of the country, the 'White Australia' movement is one with which the whole mining community is deeply sympathetic.

TIMBER CONSUMPTION.— Timber consumption in the United States now amounts to about 400 ft. board measure per capita, while in Europe the average is but 60 ft. The best managed German forest grows on an average about 50 cu. ft. of wood per acre annually. If American forests grew as well, which they do not, they would barely furnish by their annual growth the amount of wood now used. In Europe the amount of timber required for many structures is very much less than it is in the United States, masonry of one form or another generally taking its place. The time will come very soon in this country when the relative cost of masonry and wood will be much different from what it is now, and in consequence the use of timber will be restricted far below the limit of the present time. Methods of preserving timber will be employed far more extensively than today for many purposes where untreated wood is now used. One particularly useful improvement will be the substitution of woods which are now considered inferior for those of high value. An example of this is the gradual substitution in wagon boxes in place of white pine, first of yellow poplar, then cotton-wood, then red gum, and today tupelo.— R. S. Kellogg.



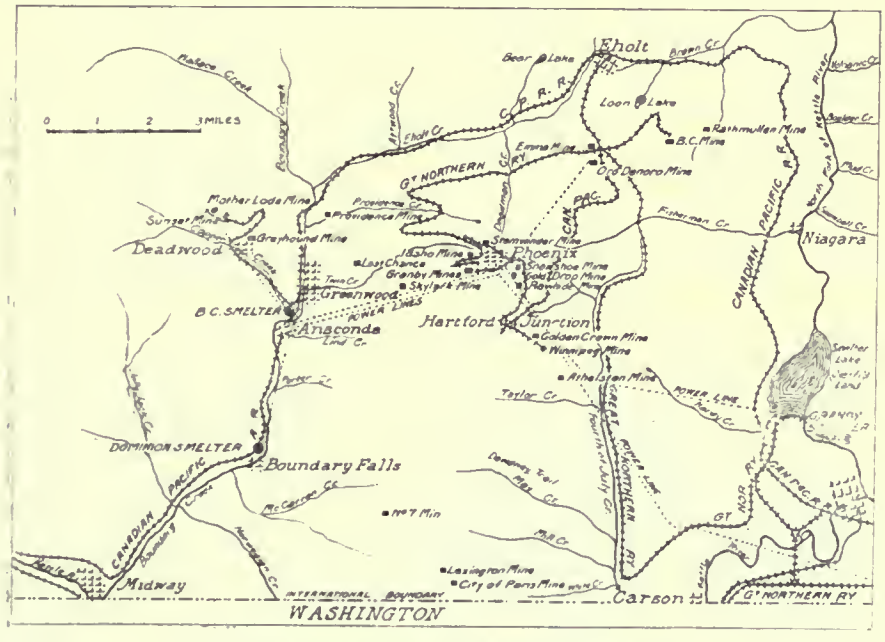
Greenwood, British Columbia.

One of the principal towns of the Boundary district.

The Boundary District, British Columbia.

Written for the MINING AND SCIENTIFIC PRESS
By FORBES RICKARD.

By the Boundary district is meant some 400 square miles of territory in British Columbia just north of the Washington state line and the international boundary; it is a district that is yearly gaining a more prominent place among the great copper-producing areas of the world. An unknown quantity a decade ago, and hindered by the low tenor of its ore, the mining and smelting development of the Boundary has grown to a splendid achievement, made possible by metallurgical advance and the aid of modern mechanical contrivances, backed by faith and a capable management.



The Boundary District of British Columbia.

The combination of geological conditions that has made possible the Boundary district is unique. Its ores are mainly chalcopyrite and pyrrhotite, with the latter mineral predominating. The ore bodies are huge, and the gangue is largely lime carbonate, with the result that the ore is self-fluxing. Railroad facilities are exceptional, and the topography of the country is favorable to cheap mining. Finally, the ore bodies are so large that they can be worked on a maximum scale, with the increasing production and higher copper prices of today. To make such a result possible, in view of the low tenor of the ore mined, the following features are prominent:

1. An ore that fluxes itself.
2. Deposits of large dimensions and fairly uniform contents.
3. Exceptional railroad facilities.
4. The combination of *all* the foregoing conditions to make possible the working of these deposits on a maximum scale.
5. A smelting operation that requires neither preliminary roasting nor a second fusion for the concentration of matte.

While the aggregate tonnage of the district represents mainly the immense output of the Granby, it has been supplemented by the production of the British Columbia Copper Co., from 1901 to 1907, and the Dominion Copper Co., from 1903 to 1907, and these, taken together with the less significant production of a number of small mines in the outlying camps, have contributed no less than 4,500,000 tons, the gross value of which has ranged between $4.90 and $6.04 per ton, and at present copper prices would figure between $7 and $8 per ton for the same metal contents. The production of this district has trebled in the period between 1901 and 1906, beginning with 390,000 tons and growing to 1,160,000 tons.

As an example of the utilization of a low-grade ore to commercial profit, the mining-smelting operation of the Granby company (the leading property of this part of British Columbia) ranks among the most successfully solved problems in the mining world of today. Though

The Granby Smelter, at Grand Forks, British Columbia.

als are mined, the first work was done on the shallow alluvium. So here, in the 'sixties, on Rock creek and Boundary creek, placer mining attracted the early prospectors. It was not until 30 years later that the properties now prominent became actively exploited. In a period of six years, from 1901 to 1906, inclusive, they have produced 135,000,000 lb. copper, having a bullion value of approximately $24,000,000, of which gold and silver combined would constitute one-third of the total. The result in the larger operation has shown a profit of from $2 to $3 per ton; although it is more than that the ore contains $1.25 to $1.50 in gold and silver, besides 27 to 30 lb. copper, nevertheless, it represents, together with the pyrrhotite ore of the Tennessee Copper Co., the lowest-grade deposits that have been made the source of profit by a copper-matting operation.

In the point of tonnage the Granby is at the head of all the metal mines in the Dominion. As cheap handling has been imperative, it has brought into play every possible economy of detail and design, accompanied by an energetic policy of expansion. The head-frame of the new main three-compartment shaft has been recently

finished and everything is being arranged for operations on a continually increasing scale. The proportion between ore reserves and ore consumption is well maintained by means of active mine development in something like 1,000 acres of productive mineral ground. The workings already aggregate 50,000 linear feet, besides diamond-drill bores by which the ore-zones are being tested. In a single year 26,000 ft. of drilling have been accomplished.

The ore is transported 25 miles, from mine to smelter, at a cost of one cent per ton-mile; power is transmitted from the Kettle river and Bonnington falls on the Kootenay river, the longer distance being 80 miles. The installations for long-distance high-tension current transmission give guarantee of ample power for all future demands, at a cost of about one-third that of the steam-plants, which have been superseded in the three principal companies, that is, the Granby, British Columbia, and Dominion. The rates to the two smaller consumers is $33 per h.p. per annum.

The first work in the Boundary district was the development of the Mother Lode claim of the British Columbia Copper Co. at Deadwood, followed by the opening of the Old Ironsides claim of the Granby group at Phœnix. Later there came the development of other camps, notably Summit, where a good deal of work is being done by the British Columbia Copper Co. The enormous surface showing that resulted from the early work, induced the building of the Canadian Pacific Railway from Robson, on the Columbia river, and, later on, the extension of the Great Northern branch line from Marcos, in Washington. Whatever the influence of this competition upon freight rates in general, there has been active competition between these railroads in bidding for shipments from mine to smelter. This applies particularly to the business of the Granby company, as the Deadwood properties of the British Columbia Co., including the Mother Lode, do not yet get service from the Great Northern. The Great Northern Railroad was built on permission granted by the Dominion government. It was not subsidized either by land grant or otherwise.

Granby operations began with two small furnaces, increased to four and then to six furnaces, with a total capacity of 1,800 tons per day. Then came the building of much larger furnaces, whereby the addition of two furnaces more brought the capacity up to 3,000 tons daily. Changes are now being made that will make the capacity of the smelter one-half as much again. Even then the mine will not be overtaxed and the development underground has already anticipated the demands of this increasing smelter capacity.

Ten years ago the Granby was a prospect with not much more than 150 ft. of work done on the Old Ironsides claim, which has been the backbone of the property. The great development since then has been directed to the exploiting of an orebody from 200 to 250 ft. wide and something like 2,000 ft. long, and with a healthy appearance in depth. Other orebodies are being explored in the Gold Drop and Monarch ground of the same company. These mine developments, taken all together, could be brought up to a pitch making them capable of maintaining a production of 5,000 tons daily. The *Boundary Mining Journal*, in reviewing the progress of the past decade, uses a picturesque phraseology when it writes: "In 1896 the silence of the centuries brooded over many places in the Boundary where in 1906 the varied voices of a complex civilization awake the echoes from the fir-clad hills. In ten short years the metamorphosis has been complete; from a little-known territory to one widely known; from the prospector's tent to the modern business buildings; from the primitive pan to the modern smelting furnace "

The geology of the district has been mapped from field-work by R. W. Brock, of the Dominion Geological Survey, in the Report for 1902, under the head of "large low-grade copper-bearing sulphide deposits." There is a singular absence of oxidation in these orebodies, which may be due to the protection afforded by 'drift' that, in the Glacial period, mantled this whole district. Glacial phenomena have been so much in evidence and so widespread in these parts as to warrant the Geological Survey in the platting of glacial striae throughout the region.

The distribution of the ore deposits seems to be along north and south lines, with the main camps of Phoenix, Deadwood, and Summit nearly paralleling each other in broad zones of mineralization. The formation varies from one camp to another and includes limestone, tuff, and chloritic-hornblendic schist, all of them much altered and high in lime, through calcareous replacement. Whether in one rock or the other, there is everywhere a distinct bedding of the country, and besides the same general direction of strike there is a prevailing dip of the vein-system to the eastward.

While the limestone areas in the three camps are scattered and recognizable only in limited patches, much limestone enters into the mass of rock of which the vein-stuff is composed. These orebodies, particularly in the instance of the Mother Lode at Deadwood, are intruded by porphyry dikes and sheets, which have induced a contact-metamorphism with the garnet, epidote, and magnetite characteristic of contact-metamorphic zones. The porphyry of the Mother Lode has been classified by the Canadian Survey as alkali-syenite or pulaskite. Granite occurs here and there and at Summit a wide vein of magnetite flanks a granite boss, which separates the orebodies of the Emma mine from those of the Oro Denoro.

A structural feature that more than anything else determines, in my opinion, the extent and shape of the orebody of the Mother Lode—and it will apply to many other mines of the Boundary—is the tendency of the lode-fissuring to flatten, so as to decrease the angle with the bedding, until the one plane so closely approximates the other that the two systems of fracture merge. Where the orebody already tends to spread away from the fissuring and along the bedding planes the result is a poor definition of the ore, greatly in contrast to the clear-cut lines prevailing where the fissuring holds at a sharp angle to the bedding. It may be assumed that the porphyry masses that have been developed in the workings of the Mother Lode have played an important role in the general mineralization and ore occurrence.

Diamond-drilling has a good field here and has been successfully applied to the finding and prospecting of orebodies throughout the district. It will doubtless continue to be utilized largely in the future. The cost of drilling ranges from $2 per foot for horizontal holes to $2.50 and $2.75 for angling and bottom holes.

In regard to the smelting problem, the Boundary ores meet the factors of iron sulphide proportion, lime, the inclusion of sufficient copper content for the matting process, and the percentage of free silica in the charge, in such a way as to constitute a flux without admixture of foreign rock or custom ore. Though some ores are bought, no dependence is placed upon a supply of custom ore high in copper, as is often the case elsewhere. The charge is ore and the ore is the charge. From 12 to 14% of coke is used. The smelting practice requires no preliminary roast and no bedding of the charge. Direct smelting to matte of converter grade dispenses with matte-concentration by re-smelting—the double smelting, as it were, which has in many cases to be resorted to in order to get matte sufficiently high in copper for con-

verting. Zinc in harmful quantity is a consideration that is here eliminated. Still, with all these favorable features, it is no child's play to contend with the necessary uncertainties of smelter operation and a low-grade ore, the whole establishment being under pressure to drive to the top notch of capacity in keeping clear of the ever-crowding ore supply, which in the one operation of the Granby means something near 3,000 tons daily.

Where rapidity of handling and the maintenance of a large scale of operation are so essential to profitable operation, it is not to be wondered that difficulties have beset smaller plants when attempting to do from the start what their predecessor had only done after years of laborious experiment and systematic upbuilding. And, as the Alaska-Treadwell operations in the early history of that company barely paid with 250 to 300 head of stamps, so in the gold-copper operations in the Boundary, even with a high copper quotation, there has been no real profit until production reached something like 400,000 tons for the single year.

The situation in regard to supply of coke and coal has been very bad recently; a shortage has been due to the September-December (1906) strike of the Fernie mines of the Crow's Nest Pass Coal Co. This shortage has interfered seriously with the regular operations of all the Boundary mines, but it is only now being relieved. With a full fuel supply re-established, the three larger companies operating in the district should get their production and smelter consumption up to 5,000 to 5,500 tons daily, equivalent to 40,000,000 to 45,000,000 lb. copper for the year.

While the details of cost of operation of these three companies are closely guarded in each instance, the following crude tabulation puts together some information that covers the subject in a general way. This relates to the Granby, the costs of which, as compared with the other two companies, have been from 1½ to 2¼c. lower per pound of copper, under the average obtaining during the last few years:

	1905.	1906.
Tons smelted, including some custom ore	590,120	832,346
Copper sold, lb.	14,237,622	19,939,004
Average price, cents per lb.	14.36	17.78
Silver, fine ounces	212.180	316,947
Average price, cents per oz	58.30	64 68
Gold, fine ounces	42,881	50,020

Figuring the 1905 production on a value of:

Copper, 28 3 lb. per ton	$3.92
Silver, 0.015 oz. per ton	0.27
Gold, 0.072	1.44
	$5.63

With a recovery of $4.66, and a working cost of $3.05, the net profit was about $1.60 per ton.

Exterior view of B. C. Smelter.

Slag run on one side of furnaces and converter floor on the other.

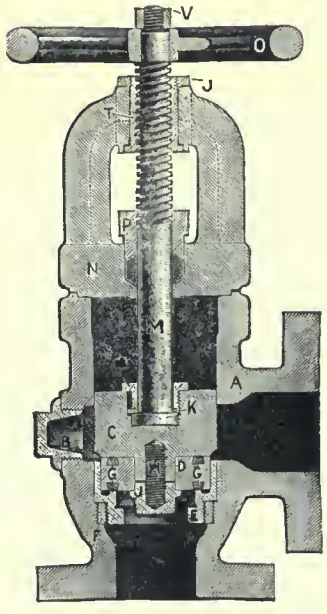
For the year ending June 30, 1906, a similar estimate would give a recovery value of $5.71 per ton and a working cost of $3.29, leaving a net profit of $2.42 per ton. On the year's output, the 1906 cost is equivalent to 8.35c. per lb. of copper, after deducting gold and silver recovery. With the higher metal quotations now prevailing and about the same working cost, the earnings of this company for 1907 will show an increase over all previous years.

FAULTS and plications are a measure of the shortening of the earth's circumference that has taken place in an orographic crisis. During the ages of preparation, the amount of shortening in the making of the geosyncline has been small, for the slowly accumulating strain reduces widths only by the difference between the shallow arc and its chord.

An Improved Blow-Off Valve.

Heretofore, in all makes of blow-off valves, the seat was so placed that as the disc approached it, there would be an accumulation of scale and sediment. The effect of this accumulation is to cut the bearing surfaces to such an extent that in a short time the valve becomes leaky. Various methods have been invented whereby the disc could be made to fit tightly in the valve-body, the object being to prevent the scale from passing onto the seat-bearing after the disc has passed and cut off the inlet. This method, however, proved unsatisfactory, as the valve soon became worn, and in a short time permitted the passage of scale and sediment. These defects have been overcome in the blow-off valve herewith illustrated. The plug fits snugly in a separate and easily removable bronze casing, which can be readily replaced when worn. Any accumulation of scale or sediment that might remain on the seat before the disc is brought in contact, is washed by the water that passes around the plug when seating.

In the sectional view, it will be seen that the plug *C* carries a reversible, double-faced disc *D*, secured to plug *C* by



stud *H* and nut *J*. This plug *C* is guided perfectly in the valve-body *A*. The bronze seat-ring *E* is screwed into a second brass ring *F*, the object being to make it possible to renew *E* easily in case same is worn. At the back of the valve is a plug *B*, the use of which is to permit the introduction of a rod to clean out the blow-off pipe when desirable. The stem *M*, which raises and lowers the disc *C*, is held in place by lock-nut *L*, which is prevented from unscrewing by non-rotating washer *K*. The threads of the stem *M* operate within the bronze bushing in the top of the yoke, which bushing can easily be removed. It will be seen from this description that all parts of the valve have been so designed that they can be easily renewed when worn or broken, the disc *D*, having two babbit-faced bearings *G G*, it can be replaced at small cost, or the user of the valve can melt out the old babbit and pour in new metal, and after this is faced off, the disc is as good as new.

This valve, known by the trade name of Duro, is constructed of the best materials and carefully tested. The Lunkenheimer company, which manufactures it, guarantees it to surpass, in durability, any other blow-off valve on the market.

Trade Treatises.

ALLIS-CHALMERS CO. issue Bulletin 1418, dealing with steel ventilating fans.

WORD BROTHERS, 60 Castro St., San Francisco, have issued a catalogue, which gives new data concerning their drill-maker and sharpener.

THE ATLAS CAR & MFG. CO. of Cleveland, Ohio, sends us Catalogue No. 1050, showing a variety of cars for mines, quarries, industrial railways, etc. This company also makes a complete line of electric cars, trucks, mining skips and buckets, track-switches, and other appliances.

THE HEWITT MACHINERY CO., of San Francisco, agents for the Atlas engines and boilers, announces that the Atlas company has been awarded a contract for an 8,300-h.p. plant of Atlas water-tube boilers, complete, for installation in the power stations of the Capitol and congressional buildings at Washington.

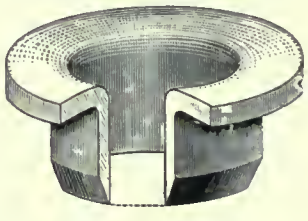
Commercial Paragraphs.

JAS. J. BROSSOIT, manufacturer of the Numa rock-drill sharpener, Salt Lake City, Utah, recently shipped one of his machines to the Tomboy Gold Mines Co. at Telluride, Colo. A number of these machines are in use in the large mines of Montana, Utah, Michigan, and Idaho.

WM. A. HEWITT, of the Hewitt Machinery Co., 37 Second St., San Francisco, has completed arrangements for the manufacture and sale of Lund's Drill-Maker & Sharpening Machine. This machine has been recommended and is in regular use in the Reclamation Service of the United States Geological Survey.

THE DEMING COMPANY.—This company originated under the name of the Silver & Deming Mfg. Co., and in 1880 they began the manufacture of hand and wind-mill pumps, hydraulic rams, etc. In 1890 the firm name was changed to The Deming Co. They were awarded the gold medal for pumping machinery in 1893 at the World's Fair. In 1894 they began the manufacture of their well-known Triplex and Deep Well pumps and this branch of their business has increased rapidly ever since. This company is prepared to handle any pumping problem using electric, steam, gasoline, or other power, and will send a complete catalogue on application to their home office at Salem, Ohio.

SPECIALIZATION in every line of manufacturing is the order of the day and the old way of patching up breaks, cutting packings from old belts or scrap and 'getting along' as best one can, is passing. It may surprise some to know that at Detroit there is a prosperous concern, THE DETROIT LEATHER SPECIALTY CO., manufacturers of the Wear Well brand of leather packings, which does not carry any stock to speak of and yet is kept busy making leather



Leather Flange Packing.

packings for machinery-users of all kinds. They make packings to order and are as particular in the selection of proper leather for specific purposes as in the manufacture of the packings. They can handle any kind of a leather-packing problem, and have made one flange-packing, which is 10 ft. 9 in. long by 4 ft. 1 in. wide. A comprehensive and exceedingly artistic catalogue has just been issued by them and will be sent on application to them at Detroit, Michigan.

THE testing plant of the GENERAL ENGINEERING CO., 159 Pierpont St., Salt Lake City, Utah, is being kept busy on various carload tests from Idaho, Nevada, and Colorado. This plant is automatic throughout and ores are treated under exactly similar conditions that they would encounter in actual practice. The plant consists in the main of the necessary crusher rolls, and Huntington mill, with trommels to screen to two sizes, Callow screens to screen from 16 to 120 mesh, with a screen ratio of two to one; four jigs; six Callow tanks; four Wilfley tables; one Callow-Neill slime table and one Kelly filter-press. This plant besides being equipped for concentration tests is so arranged that plate amalgamation and cyanide tests can be carried out either in conjunction with concentration or as separate tests. This company will be pleased to give prospective clients full information as to their terms for the different classes of tests upon application. J. M. Callow is president and general manager; James W. Neill, is vice-president.

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Editorial.

THE OFFICES of the MINING AND SCIENTIFIC PRESS are now at 667 Howard St., San Francisco, and this issue is sent from the new address.

ACCORDING to the statistics tabulated by Henry R. Merton & Co., London, the total copper supplies in 1906 were 711,675 long tons of fine metal, as compared to 682,125 tons in 1905 and 479,514 in 1900. Of the total, the United States contributed 408,475 tons; Spain and Portugal, 49,320; Mexico, 60,625; and Australasia 36,250 tons. Thus the United States is responsible for over 57 per cent of the world's production.

SIGNS OF A TIGHTENING of the money market are apparent. In New York the necessities of speculators have been excessive and call rates are mounting. In San Francisco the supply of ready money is decreasing, for the insurance payments have been spent freely and reconstruction is making heavy demands on the local banks.

IT IS A PLEASURE no longer to have to write "temporarily at Berkeley, California" and to be able to announce that we have returned, after one year's enforced absence, to San Francisco. We are two blocks from Market St. and just east of Third St., so as to be conveniently near the financial district. We shall be glad to see our friends, to whom our new offices and composing room will seem a great improvement as compared to the restricted quarters occupied recently.

THE NEW HOME of the national engineering societies was formally opened on the 16th instant by Mr. Andrew Carnegie, who had given the $1,000,000 required for the construction of the building. The principal address was that of Mr. Arthur T. Hadley, the president of Yale University. On another page Mr. Charles S. Palmer gives some of his impressions of the occasion. It was a notable event and we trust that it may mark the beginning of a new era of enlarged usefulness on the part of the important engineering organizations to which the building will serve as headquarters.

WE NOTE that college publications, in referring to appointments obtained by alumni, often overstate the nature of the position held, so that young fellows who are doing subordinate work in a cyanide plant are described as "in charge" and assistants to surveyors are labeled as "engineers" to the company. The idea is to prove that the graduates get important positions immediately they begin their career. This is a mistake, it puts the men mentioned in the position of claiming a status to which they have not attained and it throws doubt on

other items given by the same journals. The first evidence of college training should be scientific accuracy, not the irresponsible falsity of the daily press.

Undesirable Citizens.

THE letter addressed by the President to a certain unfortunate at Chicago will ring like a bugle call across the width of this continent. Mr. Roosevelt has justified himself in characteristic fashion. While the judicious may have grieved that he should make a disparaging reference to men under trial, it is apparent that his refereuce did not touch upon the acts for which they are being tried, but to the pestilent activities to which their lives have been devoted. There may be room for criticism of the President even now, as there is for many of the impulsive things that he does, but it is the essential manliness of his position and the fact that he speaks for American citizenship at its best that will delight the readers of this last utterance of his. We take pleasure in re-printing his letter in full on the next page.

To those engaged in mining, the series of events that have preceded the trial of Moyer, Haywood, and Pettibone is familiar. They are officials of an organization that has defied the law and fomented industrial unrest. Whether they are guilty of the particular acts for which they are indicted, remains to be proved. If guilty, they will be punished according to law; if not guilty, the State of Idaho will owe them a full reparation. It is unfortunate that any idea should prevail that these men are not to have a fair trial. We know of no reason for such a conclusion. When the law starts in motion it may seem to the friends of the suspects that it is vindictive and to a certain extent it becomes an action of the people against the individual. Because certain mine operators have been the avowed enemies of the suspects there is no sufficient basis for inferring that the law is taken in their interests. No; it is done for the people—in a legal and in a civic sense.

When the events in Idaho began to attract attention, the lodges of the labor unions wrote to Mr. Roosevelt, protesting against the proceedings taken against the three leaders of the Western Federation of Miners. The President gave offense by ignoring the many letters he received and by taking no action in the case. Meanwhile meetings were called in many of the large cities to influence public opinion in favor of the suspects, and those who organized these affairs went so far as to post notices all over the country, headed with the statement that "the only crime" of these men was "loyalty to their class." Great efforts have been made to represent the three labor leaders as victims of a conspiracy of capitalists, and resolutions to this effect have been passed at conventions of the Western Federation of Miners. The fact is, this whole labor controversy, in so far as it is a vendetta between capital and labor, is abhorrent to thoughtful men; it is only when the laws of the country are outraged and popular government is undermined that the community awakens to the need for curbing both sides. Most of our readers will appreciate the President's characterization of labor agitators as undesirable citizens and as the foes of their own order, but we take equal satisfaction in reading his classification of such men as Harriman. Capital and labor can well afford in these days to shake hands in sympathy and voice a joint regret that they should have for spokesmen such fellows. Moyer and Harriman both stand for incivism, that is, the opposite of what constitutes a good citizen. They represent industrial piracy. To most of our readers the incitement to disorder and the enmity to property rights, voiced by Moyer, are obviously bad, but to us the wrecking of a railroad company and the misuse of millions for speculative purposes by Harriman are eqnally to be condemned. Both are, in effect, anarchists.

Salve Atque Vale.

PARTICULAR interest attaches to the editorial page of the last issue of *The Black Hills Mining Review*. One editor bids farewell, and the other salutes his readers; but such changes happen usually for causes less notable than those mentioned in the present instance. The outgoing chief in his valedictory says that he has heard the "call of Nevada," and he answers it with alacrity, for he leaves "in a few days." He believes the Black Hills to be "a great mining camp," but he considers that Nevada is even better, and that it offers the greater opportunity. Then comes the salutatory of the new editor, who affirms his faith in the mineral wealth of the Black Hills, and expresses his belief that Nevada offers no better chance for profitable mining. To him it appears certain that the Black Hills will be "a good mining country, and a good place to live in, long after the present boom camps of Nevada have exhausted their ore supplies." All of which is interesting, because it is intensely human. Our sympathies, we confess, are with the new helmsman who is to steer the *Mining Review*, although we admire the energy of the gentleman who is obedient to the call of the desert, in fact, we hope both may succeed, and that it will be a subject capable of dispute, two years hence, whether the Black Hills or Nevada is the better region. For the moment, we remember that water-tanks are far apart in the desert, the wild cat is rapacious, and the booster is rampant. The Black Hills is a pretty good place for a home, and it has a hole in the ground called the Homestake, that has prodnced gold in large quantity for thirty years, and gives assurance of doing so for thirty years more. In contrast is the Mohawk, which produced $50,000 per day for 100 days, and made the fortunes of several men in the course of six months. And then there is that nameless grace, the charm of the unknown. The "call of Nevada" is a lure to the adventnrous, to those who can see gold mines just beyond the next range of hills, to those to whom it ever appears that the oxen farthest from home have the biggest horns. Without such men mining would shrivel to a petty business; we need the men of large hope and superfluous energy. We need also the conservative man, not easily enticed by the vagrant flames of speculation, the man that will not take his hand from the plough nntil the furrow is made. So here's luck to both of the editors!

By the Way.

It will be known to our readers that the President has been criticized for referring to Moyer and Haywood as "undesirable citizens," for these officials of the Western Federation of Miners are under trial at Boise City, Idaho, charged with responsibility for the murder of Governor Stennenberg of Idaho, and for other crimes in Colorado. The chairman of the Cook county Moyer-Haywood conference, at Chicago, wrote to Mr. Roosevelt, objecting to his remark, and the President replied in a letter, which we publish in full herewith:

"Dear Sir—I have received your letter of the 19th instant, in which you inclose the draft of formal letter which is to follow. I have been notified that several delegations bearing similar requests are on the way hither. In the letter you, on behalf of the Cook county Moyer-Haywood conference, protest against certain language I used in a recent letter, which you assert to be designed to influence the course of justice in the case of the trial for murder of Messrs. Moyer and Haywood. I entirely agree with you that it is improper to endeavor to influence the course of justice, whether by threats or in any similar manner. For this reason I have regretted most deeply the action of such organizations as your own in undertaking to accomplish this very result in the very case of which you speak. For instance, your letter is headed "Cook County Moyer-Haywood-Pettibone Conference," with the head lines: "Death cannot, will not, and shall not claim our brothers." This shows that you and your associates are not demanding a fair trial or working for a fair trial, but are announcing in advance that the verdict shall only be one way, and that you will not tolerate any other verdict. Such action is flagrant in its impropriety, and I join heartily in condemning it.

But it is a simple absurdity to suppose that because any man is on trial for a given offense he is therefore to be freed from all criticisms upon his general conduct and manner of life. In my letter to which you object I referred to a certain prominent financier, Mr. Harriman, on the one hand, and to Messrs. Moyer, Haywood, and Debs on the other as being equally undesirable citizens. It is as foolish to assert that this was designed to influence the trial of Moyer and Haywood as to assert that it was designed to influence the suits that have been brought against Mr. Harriman. I neither expressed nor indicated any opinion as to whether Messrs. Moyer and Haywood were guilty of the murder of Governor Steunenberg. If they are guilty they certainly ought to be punished. If they are not guilty they certainly ought not to be punished.

But no possible outcome either of the trial or the suits can affect my judgment as to the undesirability of the type of citizenship of those whom I mentioned. Messrs. Moyer, Heywood and Debs stand as representatives of those men who have done as much to discredit the labor movement as the worst speculative financiers or most unscrupulous employers of labor and debauchers of legislatures have done to discredit honest capitalists and fair-dealing business men.

They stand as the representatives of these men, who by their public utterances and manifesto, by the utterances of the papers they control and inspire, and by the words and deeds of those associated with or subordinate to them, habitually appear as guilty of incitement to, or apology for, bloodshed and violence.

If this does not constitute undesirable citizenship, there certainly would never be any desirable citizens. The men whom I denounce represent the men who have abandoned that legitimate movement for the uplifting of labor, with which I have the most hearty sympathy; they have adopted practices which cut them off from those who lead this legitimate movement. In every way I shall support the law abiding and upright representatives of labor, and in no way can I better support them than by drawing the sharpest possible line between them upon the one hand, and on the other hand those preachers of violence, who are themselves the worst foes of the honest laboring man.

Let me repeat my deep regret that any body of men should so far forget their duty to their country as to endeavor by the formation of societies, and in other ways to influence the course of justice in this matter. I have received many such letters as yours. Accompanying them were newspaper clippings announcing demonstrations, parades, and mass meetings designed to show that the representatives of labor, without regard to the facts, demand the acquittal of Messrs. Haywood and Moyer, when such meetings can, of course, only be designed to coerce Court or jury in rendering a verdict, and they, therefore, deserve all the condemnation which you in your letter say should be awarded to those who endeavor improperly to influence the course of justice.

You would, of course, be entirely within your rights if you merely announce that you thought Messrs. Moyer and Haywood were 'desirable citizens,' though in such case I should take frank issue with you, and should say that, wholly without regard to whether or not they are guilty of the crime for which they are now being tried, they represent as thoroughly an undesirable type of citizenship as can be found in this country—a type which, in the letter to which you so unreasonably take exceptions, I showed not to be confined to any one class, but to exist among some representatives of great capitalists, as well as among some representatives of wage workers.

In that letter I condemned both types. Certain representatives of the great capitalists in turn condemned me for including Mr. Harriman in my condemnation of Messrs. Moyer and Haywood. Certain of the representatives of labor, in their turn, condemned me because I included Messrs. Moyer and Haywood as undesirable citizens together with Mr. Harriman. I am as profoundly indifferent to the one condemnation in one case as in the other. I challenge as a right the support of all good Americans, whether wage-earners or capitalists, whatever their occupation or creed, or in whatever portion of the country they live, when I condemn both the types of bad citizenship which I have held up to reprobation. It seems to me a mark of utter insincerity to fail thus to condemn both and to apologize, for either robs the man thus apologizing of all right to condemn any wrong-doing in any man, rich or poor, in public or in private life.

You say you ask for a 'square deal' for Messrs. Moyer and Haywood. So do I. When I say 'square deal' I mean a square deal to everyone; it is equally a violation of the policy of the square deal for a capitalist to protest against denunciation of a capitalist who is guilty of wrong-doing, as for a labor leader to protest against the denunciation of a labor leader who has been guilty of wrong-doing. I stand for equal justice to both, and so far as in my power lies I shall uphold justice, whether the man accused of guilt has behind him the wealthiest corporations, the greatest aggregation of riches in the country, or whether he has behind him the most influential labor organization in the country."

SMELTING IN BRITISH COLUMBIA.—At the Granby smelter, in British Columbia, the analysis of charge is: Silica, 38½%; lime, 20%; and iron oxide, 23%. With a high matte-fall and driving fast, the 20-ft. furnaces put through from 700 to 800 tons of ore per diem. While running to higher grade of matte the capacity ranges between 600 and 700 tons daily.

Personal.

F. L. BOSQUI is in Arizona.

MARK L. REQUA is at Ely.

R. A. F. PENROSE is in South America.

ALGERNON DEL MAR is now at New York.

WALDEMAR LINDGREN is in San Francisco.

ARTHUR TAYLOR has returned to London from India.

C. S. THOMAS, of Denver, was in San Francisco this week.

J. R. FINLAY has changed his office to 2 Rector St., New York.

J. MORGAN CLEMENTS is examining mines in the Butte district.

L. W. WICKES is manager of the Ely-Witch mine at Ely, Nevada.

ELMER M. BRAY is visiting San Francisco from Hillside, Arizona.

W. P. HAMMON has returned from New York to San Francisco.

ALEXANDER MAITLAND, of Negaunee, Mich., is in San Francisco.

AUGUSTE MATHEZ has been examining mining methods in Wisconsin.

W. JUDSON is in San Francisco on his way from Butte to the Argentine.

DONALD DUNCAN is with the Tres Amigos mine, at La Junta, Costa Rica.

J. M. RICHARDS, recently assayer for the East Butte Co., has gone to Goldfield.

R. C. RUCKER is superintendent of the Pirita mine, near Alamos, in Sonora, Mexico.

JAMES W. ABBOTT has been examining mines at Bingham, Utah. He is now at Pioche.

FOSTER WILLIAMS is superintendent of the Pinguico M. & M. Co. at Guanajuato, Mexico.

THOMAS COX is general superintendent for the Steptoe Valley M. & S. Co. at McGill, Nevada.

V. B. SHERROD is superintendent of construction for the Tajo de Dolores Mining Co. at Guanajuato, Mexico.

C. W. WHEELOCK, of New York, is on a visit to San Francisco, incidental to professional work in Nevada.

D. W. BRUNTON is in Japan, on his way around the world, taking a well-earned rest from professional work.

NORMAN C. STINES is on his way from Los Angeles to Trinity county, to take charge of the Yellow Rose mine.

ELISHA HARRIS is superintendent for the Guanajuato Amalgamated Gold Mines Co. at La Luz, near Guanajuato, Mexico.

RICHARD PEARCE sails from New York on May 8, on his way from Colorado to Cornwall, where he will spend the summer.

H. S. LEACH is superintendent of construction for the Guanajuato Development Co. and the Peregrina M. & M. Co. at Guanajuato, Mexico.

MALCOLM MACLAREN, late mining specialist to the Government of India, passed through San Francisco, on his way from Calcutta to London.

G. A. RICHARD, the general manager of the Mt. Morgan mine, in Queensland, is expected on a visit to the United States. He comes to study electrolytic methods.

L. VOGELSTEIN & Co. of New York, give the figures of German consumption of foreign copper for the months of January and February, 1907, as follows:

Imports of copper	17,294 tons
Exports of copper	1,250 "
Consumption in January and February	16,044 tons

As against consumption during the same period in 1906 of 20,251 tons. Of this quantity, 13,698 tons were imported from the United States.

Obituary.

CHARLES C. SWART, for fourteen years in charge of the advertising and catalogue business of the Gates Iron Works, Fraser & Chalmers, and the Allis-Chalmers Co., of Chicago, later occupying a similar position for over two years with the Union Iron Works, and for the past year with the Fulton Iron Works, San Francisco, died in St. Luke's Hospital, in this City, on April 9, the result of an operation for appendicitis. Mr. Swart was acknowledged by all commercial artists in the West as the peer in air-brush work, especially on machinery drawings; his knowledge of machinery, particularly in the mining line, enabled him to construct from working drawings copy that could not be distinguished from photographic work in halftone productions. He was the pioneer in air-brush work in San Francisco, and his work is wellknown among machinery builders in this City, and on the Pacific Coast. His last work, the 'Gold and Silver Milling Machinery' catalogue, just published by the Fulton Iron Works, which he wrote and illustrated, is considered by mining experts and others as the most complete and best illustrated book treating on these subjects published. Mr. Swart was a genial man to meet, and, while particular in his work, was well liked by acquaintances and others with whom he came in contact. He leaves a widow, son, and two daughters to mourn his loss.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco, April 21.

Crackerjack	$0.32	Central Eureka	$1.00
Con. Virginia	1.15	Savage	0.92
Mexican	0.95	Sierra Nevada	0.59
Ophir	2.50	Yellow Jacket	1.03
Belmont	4.65	Midway	1.65
Combination Fraction	5.30	Montana	3.58
Goldfield Con	8.43	Mohawk	15.00
Jim Butler	1.26	Nevada Hills	4.50
Jumbo	4.35	Red Top	4.10
Jumping Jack	0.16	Sandstorm	0.83
Manhattan Con	0.75	Silver Pick	1.28
Manhattan Dexter	0.20	Tonopah Ex	3.85

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
April 19	24⅛	6	6⅞	65½
" 20	24⅛	6	6⅞	65⅝
" 21	Sunday.	No market.		
" 22	24⅛	6	6⅞	65¼
" 23	24⅛	6	6⅔	65½
" 24	24⅛	6	6⅔	65¾
" 25	24⅛	6	6⅔	65¾

ANGLO-AMERICAN SHARES.
Cabled from London.

	April 18.	April 25
	£ s. d.	£ s. d.
Camp Bird	1 3 9	1 3 6
El Oro	1 6 9	1 6 3
Esperanza	2 3 0	2 3 0
Dolores	1 12 0	1 11 3
Oroville Dredging	0 17 6	0 17 0
Stratton's Independence	0 3 6	0 3 3
Tomboy	1 17 6	1 18 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices	
	April 18.	April 25.
Bingham Central	1½	1½
Boston Copper	27⅝	28⅞
Calumet & Arizona	157	165
Cumberland Ely	8¾	8¾
Dolores	8	8
El Rayo	5⅞	5½
Guanajuato Con	4	4
Giroux Con	9⅛	9⅛
Greene Con	24½	24¼
Nevada Con	13⅝	14⅜
Nipissing	13	14¼
Tennessee Copper	40½	39¾
Tonopah Ex	4	3½
Tonopah-Belmont	4¾	4⅜
Tonopah	18	18
United Copper	60¾	62¼
Utah Copper	28½	29½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

Mining Summary.

ALASKA.

KETCHIKAN DISTRICT.

A drift has been started on the Mamie to cut the new ore-body which was proved by the diamond-drill. Exploration work with the diamond-drill is being continued at other points in the mine.——The Mt. Andrew company shipped 4,500 tons last month. An additional five-drill compressor has been ordered. The 165-ft. level is the main working level at present, but the shaft will be sunk at once.——The Niblack shaft will be sunk another 100 ft.——It is reported that the Hadley smelter will soon start, and will have on hand a sufficient supply of coke and ore to insure a long, continuous run.——There seems to be some hitch in the plans for the reorganization of the Alaska Copper Co., and but little is being accomplished at the mine or smelter at Copper Mtn. The Rush and Brown mines are idle, with 20,000 tons of shipping ore on the dump, and this state of affairs is due to the failure of the Alaska Copper Co. to ship the product, although it has a lease on the mine.——At the Valparaiso mine, a surface tramway is in the course of construction, from the mine to the beach in Johnson's inlet.

NOME DISTRICT.

In addition to the stamp-mill that will be erected in Nome this summer, there will be a small mill in operation at the head of Snake river. At first there will be but three stamps in the latter mill. C. F. Jameson and J. M. Conley are the owners.—— A good strike has been made on Centre creek, on the No. 4 Vogel & Williams claim. The dirt is 10 ft. thick, and will average 15c., which should pay handsomely.—— A rich strike has been made on a tributary to Coffee creek. Four feet of gravel running 30c. to the pan is reported.—— Ford & Cooper made a good strike on McDonald creek while sinking on a fraction adjoining the Big Chief claim.

ARIZONA.

COCHISE COUNTY.

At a recent meeting of the stockholders of the Tombstone Consolidated Mines Co. the officers were all re-elected. The most significant action taken at the meeting was the order to amend the articles of incorporation, changing the provisionary bonded indebtedness to $5,000,000. This is understood to mean that the company will be forced to increase its issue of bonds, which bear interest at 6% and are underwritten by the Development Co. of America. It is reported that the former issue was for $3,000,000 and that this amount has been spent, making a greater bonded indebtedness necessary. The water problem has been much more serious than was anticipated at the time of the consolidation, and, while moderate ore shipments have been maintained, the ore has been quite low in grade, and the chief source of supply has been the old stope filling left by the former operators.——At Bisbee, many of the men are returning to work at the various shafts, and the union pickets are having but little success in soliciting new members. Over 2,000 men were at work the first of last week, and the number is daily increasing. The union parade showed a strength of about 700 men, although it is claimed that 1,300 men attended the big meeting. Many of the union men are leaving the camp, while non-partisan miners are coming in from all the outlying camps to get work in Bisbee.—— It is reported that the election of C. H. Dodge, of the Phelps-Dodge company, to the directorate of the Greene-Cananea was accomplished to aid in getting better rates on lumber for the Phelps-Dodge properties, which spend from two to three million dollars per year on lumber. Heretofore they have bought lumber from Puget Sound, but it is expected that now much of it will come from Chihuahua, where the Sierra Madre Lumber Co. is operating.——The smelter at Benson has changed hands, the Southwestern Smelting Co. having transferred it to the Boston & Arizona Smelting Co., a corporation of Nevada.——There is activity in the camp of Johnson. The Bonanza Bell Co. is employing 40 men and the shaft is being sunk. The Cochise shaft is over 400 ft. deep. Work has been temporarily suspended at the Copper Chief, the shaft of which is 200 ft. deep. The new hoist has been received at the Republic property.

GILA COUNTY.

(Special Correspondence).—Attention is turning to some of the old silver mines at Globe, which were noted for their output of the white metal 30 years ago, and were abandoned because of the precipitate decline in the price of silver, and high operating costs. Among the richest of the mines were the Stonewall Jackson, Hannibal, R. E. Lee, and Little Mack, situated at McMillen, 20 miles east of Globe, and its strong rival in 1876-78. These old properties, together with a number of other claims, 32 in all, have been taken over by a strong company of Globe men organized by V. Y. Smith. The name of the new company is the McMillen-Stonewall Mining Co., capitalized at $1,000,000, with shares of $1 each. The property has a length of three miles on the Stonewall Jackson lode, which varies in width from 40 to 100 ft. The Stonewall Jackson mine was worked by the old company up to 1883 and one claim is reported to have produced $500,000. Later, lessees took out about $100,000. The Hannibal mine yielded $50,000; R. E. Lee, $35,000, and Little Mack, $60,000. The workings on all these mines are shallow, the Little Mack being only 75 ft. deep. The shaft on the Stonewall Jackson was sunk to 600 ft., but no ore was stoped below 230 ft. The shaft was in ore all the way down and there was high-grade ore in sight when the mine was abandoned and partially filled with water. The company's mill had only five stamps, and no ore running less than 50 oz. was milled. Some ore was sent to Yuma by wagon, and thence to San Francisco.——The Stonewall Jackson is one of the best defined fissure veins in the county, and besides its value in silver, shows indications of copper in many places on the surface. Some preliminary work has recently been done, most important of which was the construction of a good wagon road from Rice Station on the G. V. G. & N. railroad to the mine, 22 miles distant. Grading has commenced for a three-compartment shaft to be sunk 1,000 ft. A 16 by 20 in. Hendrie & Bolthoff steam-hoist and two pumps are expected soon, and a cross-compound Rand compressor with a capacity of seven drills. Sinking the shaft began last week. The officers of the new company are V. Y. Smith, president; and H. L. Coombs, treasurer.

Phoenix, April 23.

GRAHAM COUNTY.

The Arizona Copper Co.'s output for March was 1,372 tons of bessemer copper, while the Shannon Copper Co. produced 740 tons.——A petition has been circulated in Morenci and Longfellow asking for an increase of 50c. per day in the wages of all Americans and Mexicans employed by the Detroit, and the Arizona copper companies.

MOHAVE COUNTY.

The Deluge Wash mill, which has been erected at the old Berkeley mine, is ready to start, but sufficient fuel is not yet available.——At a depth of 300 ft. in the Standard Gold M. Co.'s property the vein is still holding and carries gold and copper.——Thomas Brayil reports the sale of the Lucky Boy mine to English people, and a smelter will be erected at Kingman. The company will also develop the Arizona-Goldfields mines, south of Kingman.——Good progress is being made on the 20-stamp addition to the Quartette mill, and it will be running within two months.——A good strike of silver ore is reported in the winze in the north tunnel of the Treasure Hill M. Co. A hoist will soon be in place and a pumping plant will be necessary.——A rich pocket has been encountered at the 60-ft. point in the Holy Moses mine.——The Gold Road shaft is down 800 ft. and a station is being cut at that point. The shaft will be continued at once, to the 900-ft. level. Changes in equipment at the mine and mill are probable.

YAVAPAI COUNTY.

The Crown King mine is again to be a producer, after having been tied up in litigation for several years. Sufficient funds have been raised to finance it. This property is supposed to have produced $2,000,000 before it was closed, and paid $300,000 in dividends. Charles Broan will be the

superintendent; Lewis J. Link is president of the company, and Edwin T. Gillespie is treasurer. The tunnel is now 2,400 ft. long, the face having a depth on the vein of 600 ft. The main shaft is 500 ft. deep, and will be sunk at once to the 700-ft. point, from which a drift will be run on the vein, underneath the old bonanza stopes. The mill has a capacity of 120 tons per day, and concentrates will be shipped to the Humboldt smelter. The company owns a group of 60 claims.

CALIFORNIA.

NEVADA COUNTY.

The Sultana mine has been unwatered, and work has begun there. The task of pumping this mine dry has been an arduous one, requiring several weeks, the trouble originating in the failure of power during the heavy storms of the winter.—— Three shifts are working at the Posey Canyon gravel mine. The tunnel is being driven, and will reach the gravel bed in the ancient river channel within six weeks. The property lies three miles northwest of Grass Valley.—— There are over 300 men on the payrolls of the mines of Nevada City and territory immediately adjacent. This force is distributed among the different properties as follows: Champion, 100 men; Murchie, 40; other Willow Valley mines, 40; Union, 12; Blue Tent, 12; Mountaineer, 20; Oustemah, 14; Union Hill, 12; Charonnat, 10; Indian Flat, 10; miscellaneous, 40. Total, 310 men.

SHASTA COUNTY.

The Stauffer Chemical Co. has bonded a group of eight claims, in the Lower Springs district, of E. P. and J. C. Conner. The working bond will run for 18 months, and an attempt will be made to save the copper and gold content. ——George Payne has succeeded N. W. Keith as superintendent of the Mad Ox mine on Whisky creek. This is a part of the Cariboo holdings, the principal property being in the Salmon River country of Siskiyou county.——Work is progressing on the Shasta mine extension of the tramway to the Balaklala terminal.

Development work is progressing at the Yankee John mine, near Centerville. This property was sold by John Reese to Pittsburg people. A shaft has been sunk 100 ft., and cross-cutting to the vein has started.—— Ore is transported from the Shasta King mine to the head terminal of the Balaklala tramway by an inclined skip, the track having an angle of about 45°.—— The Bully Hill company is pushing work on its mine development, smelter revision, and the construction of the broad-gauge railroad up Pitt river from Kennet. John B. Keating, formerly of Helena, is the manager.

SISKIYOU COUNTY.

The Queen of Sheba mine on Patterson creek has been equipped with electric machinery for mine operation.—— J. Wade has finished prospecting with churn-drills at Oro Fino, in the interest of the company operating the Callahan dredge, and prospecting has started on Indian creek, near the old site of Hoopeville.——The New York mine, on Indian creek, near Fort Jones, has been taken over by a reorganized company which will be known as the Big Moose Mining Co. An electric plant will be erected, and the shaft sunk 1,000 ft.——About 30 men have been working on the flats at Hawkinsville since the first of the year, and a good run is expected.——The St. George Hydraulicking Co. has had its giant at work for three months. The property of this company includes 140 acres, together with the upper Greenhorn ditch and all the waters of Canal gulch. ——The Robert Sylvester Mining Co. has uncovered a large area of bedrock and expects to make a good clean-up.—— There is much activity on Scott bar, now that the stormy weather is over. The Gold Point Mining Co. is driving a tunnel to tap the old Magoffey channel. The tunnel is in 200 ft. and no bedrock has been struck.——An important strike is reported on the First National property in the Blue Ledge district. In driving a cross-cut at a depth of 150 ft., a good vein of copper ore was encountered.——Attention is being attracted by the discovery of a lode of copper ore at Yellow Butte, north of Mt. Shasta.——A fine body of ore has been encountered on the 300-ft. level of the Morrison & Carlock mine, in Quartz valley, 40 men are employed, and the 10 stamps drop steadily the year around.

There are two tunnels and a shaft on the Ten Lakes mine, of which C. S. Osborn is manager. Work has been going on all winter in one of the tunnels and a vein 50 in. wide is being developed.——The wrecked aerial tram between the Bonanza King mine and the mill has been repaired. Joseph Porter, the superintendent, states that the mill will soon be running. This is the mine that was bonded to the Treadwell Brothers, of Alaskan fame. About $200,000 has been spent in surface improvements alone.——The people of Hornbrook are excited over the discovery of gold about four miles northwest of the town.——A third giant has been put in operation on the Quartz Hill mine at Scott Bar. L. D. Crawford is the superintendent.

Final payment of $70,000 has been made by Henry E. Wood of Denver, on the Advance mine, situated beeween Etna Mills and Sawyer's Bar. The property formerly belonged to A. C. Brokaw. The small mill will be enlarged and equipped with electric power.

Development is progressing at the Advance mine, and the mill is running steadily. A compressor and electric power will soon be added to the equipment.—— The Homestake company is driving the cross-cut adit and expects soon to reach the lode.—— The Sheba mine will soon have electric power. This property will be operated extensively this year under the supervision of Noel E. Graves.—— Most of the men employed at the Grouse Creek hydraulic mine, near Callahan, have quit work, because the working hours have been increased from nine to tenhours.

Over 500 men are employed in the Blue Ledge copper mining region, in the Elliott Creek district. This new mining district extends all along the Oregon border, and down to the Klamath river at Oak Bar.—— The Patterson Creek Mining Co., operating the Sheba mine in Scott valley, has levied another assessment of 10c. per share for further development work.—— The Mono mine, at Humbug, has been sold to C. C. Broadwater, of Montana. William Forstner made the examination. This mine has been worked for several years, and is well equipped.

TRINITY COUNTY.

A good strike is reported in the Golden Jubilee mine, on Coffee creek. This property is owned by a Santa Rosa company, and W. L. Chapman is the superintendent. Several good finds have been made at this mine, and a 10-stamp mill is nearly completed that will take the place of the Huntington mills that have been used. Thirty men are employed, and more will be put on as soon as the new mill is running.

COLORADO.

BOULDER COUNTY.

The milling plant of the Good Luck M. & M. Co., on Sugar Loaf Mtn., is being enlarged.——The Taylor Gold M. Co. is erecting a 20-ton cyanide plant at Magnolia.——The first clean-up at the Wano mill at Jamestown is reported as satisfactory.——The Annuity company, operating on Sugar Loaf Mtn., has recently installed a new type of concentrating tables in the mill.

CLEAR CREEK COUNTY.

The Mendota properties are producing more ore than they have for several years. The Jewell mill is making good lead, zinc, and iron concentrates from the dumps of the upper workings, and the Mendota mill, operated by Stephens & McGrath, is working the dump material at the portal of the Victoria tunnel. The task of unwatering the lower workings on the Mendota lode is about completed and sinking will soon start.——The tramway for conveying ore from the Mammoth mine in Brown gulch, to the railroad track has been completed, and shipments will be made at the rate of two cars per day, to the concentrating mill at Dumont. Dan J. Williams is the manager.——The Nashotah mill has not been running for a few days, as repairs are being made. A new Chilean mill will be added.——The Terrible mill has started again, a sufficient supply of water now coming down the creek.

GILPIN COUNTY.

At a point 250 ft. from the portal of the Gold Run tunnel, a drift has been run on the vein for 160 ft. This property is

owned by the Union Exploration Co. of New York, and is situated near the head of South Boulder creek, near where the proposed tunnel of the Moffat railroad will penetrate the range.——An engine is being installed at the Mtn. Monarch mill in Gambell gulch, for hoisting ore up the incline from the tunnel, and it is expected that soon the mill will be running night and day on ore from the tunnel property.——A good vein has been cut in the tunnel of the Golden Rod company. Contractors have just finished 200 ft. of tunnel work, and have started on a new contract.——Work will soon be resumed on the property of the Jenny Creek M. & M. Co., which is composed largely of Pittsburg men. A mill will probably be built.

OURAY COUNTY.

The Atlas mill of 10 stamps will be enlarged to 20 stamps this summer. A new compressor has recently been installed and machines are used in stoping.——A force of 16

California.—Showing Position of the Counties.

men is employed at the Thistledown, and a raise is being run to connect the upper and lower workings. M. L. Thistle is the manager.

SAN JUAN COUNTY.

The main cable of the Aspen tram is in place and the line will soon be working. The lower tunnel is now in nearly half a mile on the vein.——The Grand Mogul mill is being enlarged, so that the capacity will be 200 tons per day, instead of one.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—A corporation will erect a plant on Big creek, southeast of Wardner, to supply the mines of that section of the Cœur d'Alene with electric power. Articles of incorporation are being drawn for the company, to be known as the Inland Power Co. The company will expend $300,000 on the building and equipment. It owns the right to a large volume of water from Big creek, and will be able to supply the mines with all the power necessary. The increase in mining operations in the Cœur d'Alene has caused a shortage of power.——The electric motor for the Frisco mine in the Cœur d'Alene is being installed. It will be operated by Spokane electric power and used principally to run the big pumps. The Frisco has recently resumed operations, after a prolonged shutdown. During this period the concentrator has been overhauled and it is expected that the Frisco will soon again take its place among the dividend producers of the Cœur d'Alene. One hundred and fifty men are employed at the mine and mill, and regular shipments are being made to the smelters.——The Frisco was a paying mine for years, several million dollars in dividends having been paid to its stockholders. At one time 400 men were employed. It has been opened to a depth of 2,000 ft. by a shaft. The cost of hoisting became so heavy that the mine was closed several years ago and the lower levels were allowed to fill with water. It was finally sold at sheriff's sale to satisfy a $100,000 mortgage, held by D. M. Hyman, of New York, and it was bid in by him. New orebodies have been uncovered and the future of the mine is promising. Gus Ehrenberg, of Gem, is the manager.——Albert Frank, representative of F. A. Heinze, is in the Cœur d'Alene to look over the ground and select a site for the concentrator of the Stewart mine, near Wardner.——Axel Swan and Thomas A. Roy have taken a $28,000 bond on the Military group of three claims in Military gulch, east of Burke. They will incorporate a company, and proceed with development work.——Preparations are being made by the management of the Lucky Calumet to install Spokane electric power early in May, when a five-drill air-compressor will be placed on the property in the Mullan district. The tunnel, driven by hand, is now in 400 ft. The Snowstorm vein and the National lode are believed to traverse the property. The National and Independent companies will also install electric power.——A foot of galena ore was found recently by Leonard and Carl Magnee in the tunnel in their property on Big creek, east of Wardner. The tunnel was driven 427 ft. years ago, and later the property was abandoned. Since the mine has come into the possession of the present owners they began retimbering the tunnel. It was while at the work that the ore was found. The foot-wall carries nearly two feet of talc, a promising indication in the Cœur d'Alene district.——Work has begun, under the management of Archie McCallum, upon the West Hecla group at Burke. This property was recently purchased by a Spokane syndicate and it is preparing to drive an 800-ft. cross-cut tunnel, which will tap the vein at a depth of 700 ft. The ground is situated near the Hecla mine.——J. H. Jackson, manager of the Cedar Creek group in the Cœur d'Alene, reports that a three-foot vein of white quartz and galena has been cut in the tunnel. The find was made 700 ft. from the portal. The ore runs 20% lead and six ounces silver per ton.——Kennedy J. Hanley, of Spokane, was awarded a verdict by the Supreme Court of the United States, giving him judgment for $125,000, due him as the proceeds of a one-eighth interest in the Skookum claim, one of the Federal group at Wardner, thus bringing to a close one of the most famous as well as bitterly fought mining cases in the Northwest, after eight years' litigation. The defendants are the Empire State-Idaho Mining Co.; Charles Sweeny, president of the Federal M. & S. Co.; and F. Lewis Clark, of Spokane.

Spokane, April 19.

(Special Correspondence).—Word from Grangeville states that a rich strike has been made in the Monument group, near Roosevelt. While the details are meagre, it is known that this strike is the result of three years of work on the Monument group.——At a recent meeting of the stockholders of the Jumbo, A. G. Wisner, of Lewiston, was elected manager of the mine, in place of Chris. Olson.——The Madrid claim in the Elk City district is being rapidly developed by the owner, Stanley Litchfield, who has driven the tunnel over 60 ft. He has struck some good free-milling ore in the dike, and expects to cut the lode at a distance of 100 ft.——The Butte capitalists, who some time ago purchased property in the Elk City district, have begun work on the Buffalo Hill placer claim.

Lewiston, April 20.

(Special Correspondence).—Stockholders of the Crooked River M. & M. Co. will meet at Orogrande, May 1, to consider forming a new company from the old. The plan is to create a new corporation with a capitalization of 600,000 shares of the par value of $5, in lieu of the present corporation with a capitalization of 1,500,000 shares, and to transfer the holdings of the present company to the new corporation. The directors have confidence in the property and believe that under the contemplated adjustment, means will be found for placing the property on a sound financial basis.

The company is the owner of the property formerly known as the Hogan, which has been a heavy produeer of gold. There is a large dike, which is quarried and conveyed to the mill.

Spokane, April 12.

NEZ PERCE COUNTY.

The Idaho company, a New Jersey corporation, operating a dredge at Pierce City, has just paid its first dividend, amounting to $10,000. Sixty per cent of the stock is owned in the East. H. M. Hare of Spokane is the principal Western stockholder. The company is incorporated for $100,000, owns 321 acres of land in the Pierce district, and it will require 18 years to work the ground.

NEVADA.

NYE COUNTY.

(Special Correspondence).—The West Extension mine has made a strike in the west drift, 100 ft. from the shaft, at a depth of 250 ft. Some of the ore runs well in gold, silver, and copper. Some ore has been sacked for shipment. The veins of the West Extension are improving toward the west, and the principal work is in that direction.—— Work on the Bullfrog Teddy is progressing and some ore has been discovered. The mine adjoins the West Extension, and gives indications of containing the same kind of ore. New machinery is being installed.—— A strike is reported from the 300-ft. level in the Mayflower Consolidated, the ore assaying $26 per ton, which is not rich enough to ship to the smelter, but can be profitably handled on the ground, when milling facilities are provided.—— Nine oil claims, comprising 600 acres, have been located six miles south from Rhyolite, on the Tonopah & Las Vegas railroad. Boring machinery has been ordered from Los Angeles by the locators.—— Work at the Victor mine is progressing, and a vein of quartz is being developed. The immediate country is being opened by drifts and cross-cuts.——Good progress is being made in the development of the orebody in the Tramp Consolidated, and some ore has been taken out.——This city is lively, and the Stock Exchange is doing a good business.—— Local mining men do not anticipate the spreading of labor troubles to this district, as employers and employees are on very friendly terms.

Rhyolite, April 18.

TEXAS.

PRESIDIO COUNTY.

The Presidio Mining Co., which has been operating a pan-amalgamation mill at Shafter for 20 years, has decided to change the process to cyanidation. Recent tests showed the horn silver to be extremely soluble in cyanide solution. F. L. Bosqui is designing a cyanide plant for this company to take the place of the pan-mill.

WASHINGTON.

COWLITZ COUNTY.

An electric railroad may be built from Castle Rock to the St. Helens mining district, 55 miles. The right of way has been secured, also water-rights and terminal facilities at Vancouver and Portland. Twelve miles of road is being used as a logging road. Work on the rest will be begun at once, and finished as speedily as possible. The route is up Green river into the heart of the Cascades. It is the purpose of the company to eventually build the road into Vancouver, then east to Mount St. Helens, tapping a rich lumber district, then back to the mountains, making a complete loop. Besides the mineral region which the road will open, it will tap one of the greatest timber belts in Washington.

FERRY COUNTY.

(Special Correspondence).—The Republic mine was sold for taxes, after paying $650,000 in dividends. The main orebody, which was followed from the cropping downward, pinched out at a depth of 616 ft. The vein-quartz, either side the pay-shoot on the 604-ft. or No. 4 tunnel level, is 53 ft. wide and too low grade to be valuable. But between that level and the surface are numerous small deposits of high and medium-grade ore included in the vein material.——An Act, providing for the Commissioners of the several counties in Washington leasing mines which had been sold for taxes, passed the last Legislature and became a law.——The dry ores from the various mines of Republic have always been sold at distant smelters under contract, according to the demand, and were generally used for converter linings in copper smelting. The Quilp, Pearl Consolidated, San Poil, Black Tail, Ben Hur, North San Poil, Trade Dollar, and other mines of the camp productive of dry ores were closed down, one after another, on account of the companies not having a market for or means of treating, the ores.

During the past two months these mines have been leased to Harry L. Rodgers, who is said to be representing Montana and New York people with ample capital, and he is promoting a scheme to consolidate these mines and work them on an extensive scale. With each lease he has taken an option to purchase, the royalty to be paid on the lease to apply on price of the mine. The Montana people who are behind him have invented a new process, unknown to any others, and they claim the ability to successfully treat the ores for less than $3 per ton, by using warm compressed air in rapidly revolving cylinders and afterward cyaniding in specially patterned tanks. Mr. Rodgers, who is not a practical millman, could not sufficiently explain the process for a lucid description, but told the writer that the people in Montana had thoroughly tested the Republic ores and were satisfied they could make their claims good.

D. W. Rathfon, a practical millman, who had charge of the Drum-Lummon mill, in Montana, for a number of years and conducted the experiments on the dry ores from the Republic camp mines, at the Mountain Lion mill, has openly stated that he can treat them for less than $1 per ton and effect a saving of 80% principally by concentration. As these experiments were conducted privately, and Mr. Rathfon has never divulged his method, it is only known to himself, the men who assisted him, and the superintendent of the Mountain Lion mine and mill. Mr. Rodgers has agreed with the mine owners to begin building a mill of not less than 100 tons daily capacity before July 1, and he will start work for a 500-ton mill within two months after effecting a consolidation of the mines.——The smelter plant at Keller camp has been completed, and the equipment is reported to be faultless, but coke for fuel can only be had by wagon haulage 26 miles from the nearest railway. The plant will therefore be hung up until a railway is built from Republic to Keller, a distance of 51 miles.

Republic, April 19.

LEWIS COUNTY.

The Ivanhoe M. Co., which owns a group of 13 claims near the Cowlitz pass, west of Spokane, has purchased four additional claims. The company is now working on a five-foot sheet of zinc, assaying 40%. The ore is stripped for 1,800 ft. A 10-ton zinc smelting plant and an electric plant will be installed at once.

OKANOGAN COUNTY.

Stockholders of the Trinity G. & S. M. Co., owning three claims near Oroville, Wash., have elected these officers: President, Edward Davis; vice-president, Martin Silver; secretary, M. Eilers; treasurer and general manager, W. H. Hicks. Plans are being made to send electric power into the mine, and to build a wagon-road from the property to the railroad, 1¼ miles.

STEVENS COUNTY.

(Special Correspondence).—The Napoleon group, consisting of 46 claims in Pierre Lake district, belongs to the British Columbia Copper Co., which has completed plans for a 500-ton cyaniding plant, to be established on the Kettle river, two miles from Boyds station, on the Washington & Great Northern railway, to treat a body of iron oxide ore about 1,000 ft. long and 500 ft. wide and developed to a depth of 150 ft. The whole mass is reported by the management to have an average value in gold of $9 per ton. The company has a six-drill compressor-plant which will be increased to a 10-drill equipment. A steam-shovel will be used for removing the ore to self-feeding bunkers, whence an aerial tramway, a mile in length, will be constructed for conveying the ore to the mill. A spur will be built by the railway company one-half a mile from Boyd's station to the mill.

Republic, April 19.

G. A. King is in charge of the Spokane lead mines in Metaline camp, north of Spokane. Work has been started on the open-cut on the Bella May claim, preparatory to quarrying the ore. An excellent showing of ore was uncovered. This was stripped far enough to prove it to be continuous, which indicates that practically the whole hillside will do to concentrate. The ore has been tested and is of milling quality. It will be left until the ore-bins are ready to receive it. A 50-ton concentrator will be built to handle the ore.

BRITISH COLUMBIA.

The Rossland mines shipped ore as follows during the week ending April 13: Centre Star, 1,350; Le Roi, 2,135; Le Roi No. 2, 385; White Bear, 35; and White Bear, crushed, 350 tons of ore.——The cylinders are in place for the new hoist at the Centre Star, and the shaft is 70 ft. below the 14th level. Ore is being mined from the glory hole on the Idaho.——At Le Roi, a machine is driving west on the 200-ft. level of the Spitzee. The Great Northern railroad has notified the Canadian Pacific that it will have no more ore for Trail until further notice, as all ore will be sent to Northport. This will necessitate blowing in another furnace at Northport, in addition to the two now running.——The

Map of Part of British Columbia.

concentrator at the White Bear was run for one shift per day, and treated 350 tons of ore, yielding a carload of concentrates.

At the Trail smelter of the Consolidated company, there were received during the week, 4,790 tons of ore. In addition to the ore from Rossland, other mines sent shipments as follows: Snowshoe, Phoenix, 1,017 tons; St. Eugene, Moyie, 668; Eureka, 149; La Plata, Kokanee, 77; Victoria, Nelson, 38; Lone Bachelor, 27; Queen, Ymir, 22 tons of ore.

In the Boundary district, two former producers have resumed shipping, these being the Idaho and the Duncan. The ore shipments for the week ending April 13 were as follows: To Granby smelter, from Granby mines, 17,630 tons; from Emma, 210 tons. To British Columbia Copper Co.'s smelter, from Mother Lode, 2,800; from Morrison, 100; from Snowshoe, 480 tons. To Dominion Copper Co.'s smelter, from Brooklyn, 1,888; from Idaho, 512; from Rawhide, 1,982; from Sunset, 896, from Mt. Rose, 96 tons. To the Trail smelter, from Snowshoe, 800; from Duncan, 20 tons. The total shipments for the week were 27,454 tons of ore. ——The Boundary smelters treated ore this week as follows: Granby smelter, 16,872; B. C. Copper Co.'s smelter, 6,760 tons; Dominion Copper Co.'s smelter, 5,344 tons; the total treatment for the week was 28,976.——W. H. Jeffery has resigned as superintendent of the Crescent mines, and will go to Cobalt.——The Last Chance property at Copper will be worked again.——A diamond-drill is being used in prospecting on the Elkhorn.

Special Correspondence.

Denver, Colorado.

Indictments Against Promoters.—Postal Authorities Take Action.—Metallurgy at Cripple Creek.—Boom Camps and Their Ways.

Much interest has been aroused during the past week by the presenting of indictments by the Federal Grand Jury against several mining promoters. The use of the mail to defraud is an offense punishable under the laws of the United States, and the Federal authorities have gained the reputation of promptly prosecuting all such offenders to the full extent of the law, whenever detected. As a result there is a healthy fear among all such gentry of falling into the clutches of the postoffice authorities, and doubtless many particularly vicious schemes that would otherwise have flourished have been thus prevented. But there are many other enterprises that are less obviously fraudulent in their nature, but are none the less effective in robbing the credulous and confiding. These the Federal authorities can rarely reach, and all such should be curbed by State legislation. Probably the most effective way is to compel all companies to file with some State officer of record a sworn statement of the essential facts of the standing of their companies. The usual promoter's prospectus is composed of glittering generalities and illogical inferences calculated to appeal to the imaginations of the uninformed, while the points upon which any attempt at sound judgment might be based are carefully concealed. Access to the real facts in the case would often serve to enable the intending investor to escape undergoing the double humiliation of the loss of his capital and of confidence in his judgment

It has often been a source of wonder that the metallurgists engaged in treating Cripple Creek ores have shown themselves so little disposed to make use of the experiments of their colleagues upon the telluride ores of Western Australia. The proverb says: "Better late than never," so the late developments in the metallurgy of these ores in Colorado are to be commended. The new 1,000-ton mill of the Golden Cycle Co. embodies some of the features developed by Sutherland and Marriner in Western Australia, and another smaller mill lately put in operation conducts its treatment along similar lines. The waste of experience is the most foolish waste of all. The purpose of metallurgy is to make money out of ore, and neither conservatism, self-pride, nor unwillingness to expend small amounts for the purpose of learning how to save large ones should prevent the manager from trying to make the maximum amount of money from his ore.

The various articles upon mining, especially in the 'boom' camps, that have recently appeared in popular weekly and monthly periodicals have disturbed the complacency of many whose mining interests are legitimate. Articles written by men lacking in technical training and without any previous experience must necessarily be faulty in some slight degree, but in the main the articles referred to have been fair, and not even the promoter can claim that he has been wronged by the too-soon criticism of one who, after a one-day examination of a matter he knows nothing about, writes a scathing denunciation of all he sees. Probably they will serve their purpose, which apparently is to give the general public an approximately correct idea of how business is sometimes carried on in mining camps. The idea of the promoter is that such articles serve to discourage investment in mining properties. But it is at least open to argument whether the investor who brings to mining enterprise nothing beyond a sum of money and a stock of profound ignorance, is a valuable acquisition to any

honest undertaking. And even the promoter can find some solace in knowing that fools are rarely deterred from their folly by having it pointed out to them.

Mexico.

The President's Message.— Prosperity of the Republic.— New Monetary Law.— Meeting of Civil Engineers.— Cyanide Plant at Pachuca.— Car Shortage.— Poor Railroad System.— Scarcity of Labor.—The Torreon Smelter.

The message of President Diaz, read before the Chamber of Deputies at the opening of the second session of the 23rd Congress on the night of April 1, showed in excellent detail the remarkably prosperous conditions of the Mexican Republic. The continued activity in mining was evidenced in the issuance of 2,000 title-deeds during the last six months of 1906. The increase in business of all kinds was shown in the fact that though the new stamp law, which went into effect on November 1, 1906, materially reduced the rate of taxation, nevertheless, the revenue from that source during the last six months of the fiscal year was 400,000 *pesos* in excess of the previous year. The success of the new monetary law seems to be proved in the way in which gold coins, in five and ten *peso* pieces, has been added to the circulation, which on September 16, 1906, amounted to 48,000,000 *pesos*, and has now reached 60,000,000; while of subsidiary silver coins there have been put in circulation 22,000,000 *pesos* (of which 7,000,000 *pesos* are of old pieces re-coined). Interested capital was assured by the President that unruly strikes would be instantly suppressed, and law and order enforced. The President further stated that the delays in the consolidation of the Mexican Central and Mexican National railroads were only such as were natural in affairs of such magnitude, but that it was now only a question of weeks for the working out of the necessary details.

Preparations are now being made by the Mexican Government, the Society of Mexican Engineers, and the members of the American Society of Civil Engineers residing in Mexico (of whom there are 53), for the 39th annual convention of the latter society, which will hold its opening session in the Mineria, Mexico City, on Monday evening, July 8, when the Secretary of Communications and Public Works, Leandro Fernandez, will deliver the address of welcome. The 29th annual convention, held in Quebec in June, 1897, the 32nd in London in July, 1900, and the coming one in Mexico this summer, are the only ones that have been held outside the United States. It is expected this session will be largely attended, and visits are contemplated to the latest interesting engineering works in Mexico, such as the water-works plant for Mexico City, at Xochimilco, the electric power plants at Necaxa and Orizaba, and the railroad and other works on the Isthmus of Tehuantepec.

Perhaps the most interesting event of the present year in mining was the inauguration last month at Pachuca of the pioneer cyanide plant in that district, this taking place at the works of Compañia Beneficiadora de Metales in the Hacienda de San Francisco No. 1, which consists of a 30-stamp mill, with Wilfley tables, special vats for

Map of Mexico.

treating the tailing by agitating with compressed air, and finishing with a system of Butters filters. This, as stated, is the pioneer cyanide plant in that famous old Mexican camp, but it will be closely followed by two similar 180-ton plants, now nearing completion, for the Real del Monte Mining Co., a subsidiary of the United States Smelting, Refining & Mining Company.

The shortage of railroad cars continues to be a serious problem throughout the Republic, and not only has it been the cause of a close approach to a coal famine, as at present in Mexico City, but has been a serious problem among the mines and smelters in getting the ores from the former to the latter. More than once in the last several months the Aguascalientes plant of the American Smelting & Refining Co. has been near to closing down, more because of a shortage of fuel than of ore, due to a lack of cars, for thousands of tons of coal and coke lie at the port of Tampico without means of transportation. And at the Monterey plant of the A. S. & R. Co., only half the furnaces have been in blast for many weeks by reason of the railroads' inability to bring in materials,

both ores and fuel. And other smelters throughout the Republic are running along with scarcely a day's supply of fuel ahead, due to the same cause. With plants along the line of the Mexican Central railroad at least 50% of the difficulties might be obviated if the road-bed were in condition for carrying heavy loads or making fast time. The attempt to do as the business demands has literally strewn the railroad with wrecks, so that it is hoped the Government may soon take charge and make the many necessary improvements. The effect on the mines may be shown by the experience of one mine alone, the Naica Mining Co., in the State of Chihuahua, where it is said something like 200,000 tons of ore were on the dump awaiting shipment, and for several months the company has not been able to get more than three or four cars, when the normal shipment amounts to about 150 cars. When it is taken into consideration that this condition has existed now for some-

Montana.

thing over six months, its seriousness may be imagined. Added to this is the difficulty of obtaining labor, for the wages have so increased throughout the mining districts that now the laborers obtain in a few days the sums for which they formerly had to work a week, and so the great lazy louts, satisfied with that, remain idle the rest of the week, a curse to the country, and a trial to the mining companies and others that need men, until it has almost come to a pass where the Government must step in, and by some kind of a vagrant law force this class of loafers to work for the building up of the country in place of enlisting them in the army, as is done from time to time when the Government needs recruits.

The excellent showing made by the smelting plant of the Torreon Metallurgical Co. has given rise to several rumors to the effect that the A. S. & R. Co. was again after this plant, all of which rumors have been continually denied by Ernesto Madero, president of the Torreon company. It would seem, though, that the Trust must get the plant, for it is the most successful competitor, smelting as it does something over 20,000 tons per month, or 258,552 tons in 1906, an increase of about 10% over 1905, and 25% over 1904. The plant consists of eight lead furnaces and two copper furnaces, and a copper converter is being erected. For the latter and other improvements, the capital stock of the company has just been increased from 3,500,000 to 5,000,000 *pesos*. The last year has shown a profit of 775,285 *pesos*, of which 104,602 *pesos* was expended in improvements, and 420,000 *pesos* (or 12%) paid in dividends. The company has the Cabrillas mine, near Saltillo, under lease, and from there obtains plenty of lead, and from the San Diego mine and mill, at Santa Barbara, Chihuahua, plenty of lead is also obtained. The latter is likewise a heavy zinc producer. Custom ores containing lead and copper, as well as the necessary silicious ores, come to this smelter from all over the Republic, successfully competing with the Trust at many points.

Butte, Montana.

Decreased Output of Copper.—Mining News From Butte.—Another Deep Shaft.—Silver Mine Near Dillon.—Dividends From the Coeur d'Alene.

The production of copper for April will probably not exceed 28,000,000 lb., and it may be even less. The total production from Butte for the first four months of the year will be between 15,000,000 and 18,000,000 lb. less than that of the same period in 1906. Many causes contributed to the decrease, including labor troubles, severe winter weather, fuel shortage, and lack of transportation facilities. A gradual reduction in the percentage of copper in the ore mined by the Amalgamated companies makes unlikely a material increase in the output of copper during the remainder of the year.

The Trenton Co. has about completed a station at the 2,100-ft. level of the Gagnon mine and will shortly begin cross-cutting to the vein at that depth.——The North Butte Copper Co. is carrying on a lot of development work in the Berlin, Edith May, and Miners Union claims. On the Speculator vein the company has sunk a winze from the 1,600-ft. level and from the winze drifts have been run on the vein, opening good bodies of ore assaying six per cent copper.——The Butte Coalition Co. is mining about 1,500 tons of ore per day, and is pushing development work in the Rarus, Corra, Minnie Healey, Tramway, and Alice mines. Ore is coming from the Rarus, Minnie Healey, Corra, and Nipper, and some from the Pennsylvania.——The Butte-Montana Co. is cutting a station at the 900-ft. level of the Alex Scott mine. The shaft is to be put down 1,200 or 1,500 ft. On the 600-ft. level the company has some fine ore, carrying copper glance. Some of it is being shipped.

New York and London men have been brought together in a syndicate to develop a group of claims, 11 in number, situated just south of the properties of the Butte & Bacorn Mining Co. It is expected that exploration work will begin about the first of May. Before the syndicate took hold of the enterprise the ground was thoroughly examined by an English engineer who made a favorable report on it. He will be in charge of the work. The plans are to equip the property with electrical machinery and to sink a four-compartment shaft at least 1,500 ft., which will take more than two years. Sixty feet per month for a four-compartment shaft is considered good progress. The men interested in the enterprise will put up the money for the work until a sufficient showing has been made to warrant the organization of a company, a proceeding that has the merit of novelty, as the usual method is to organize a company, sell stock, and then let somebody else look for a showing in the ground.

The Butte-Milwaukee Copper Mining Co. has sunk its new shaft on the Colonel Sellers to a depth of 215 ft., and expects to make more rapid progress hereafter, as it is now better equipped for work. The shaft is in solid rock, it being the intention of the company to keep away from the vein in order to insure a good working shaft.

The Pittsburgh & Montana Mining Co. has opened a fine body of copper glance in a winze from the 1,400-ft. level, and drifts are being extended. The company is shipping five cars of ore daily, equal to more than 200 tons. The physical condition of the property has been greatly improved under the management of Oscar Rohn,

and miners employed in the Pittsmont mines report that the company will soon be able to increase its output.

Some excellent smelter returns on ore from the mine of the New Departure Mining Co., 12 miles from Dillon, have been received. A recent shipment of 25 tons to the Washoe works contained 15 tons of first-class and 10 tons of second-class ore, the latter yielding 337 oz. silver, $1 in gold per ton, and 2.2% copper; the second-class giving 65 oz. silver, $7.20 in gold, and no copper. W. B. Orem, deputy State Mining Inspector, says the New Departure is really a wonderful property. In a raise being made from the 250-ft. level a body of ore has been encountered, some of which assays 1,008 oz. in silver. A fair sample of the ore in the shaft, says Mr. Orem, will assay 150 oz. per ton. While the company is doing a lot of development work from the old shaft, a new shaft is being sunk and is now down about 35 ft. In the new shaft a vein o ore has been cut that is three feet wide and assaying 310 oz. silver per ton. Several months ago the bond was takeu up and the title now rests in the company, free of incumbrance. There is about $15,000 in the treasury and there are about 2,500 tons of ore on the dump that will run from 40 to 60 oz. silver. The property is well equipped for development as well as mining, the company having two 40-h.p. boilers, an 8½ by 10 in. hoisting engine, a six-drill compressor, and pumps of sufficient capacity to handle a large amount of water. Jesse Davis is in charge of mining operations and 10 men are employed.

Basing the estimates on dividends paid during the first three months of the year, the Cœur d'Alene will pay about $7,000,000 in dividends in 1907. Seven companies have disbursed $1,547,500 in three months, as follows: Federal Mining & Smelting Co., $510,000; Bunker Hill & Sullivan, $540,000; Hercules, $228,000; Snowstorm, $140,000; Hecla, $100,000; Success, $20,000; Monitor, $9,500; total, $1,547,500. The Snowstorm and Monitor are copper mines; the Success produces zinc and lead; the others are silver-lead producers. The Black Cloud-California Co., operated by Pittsburgh men, is said to have earned $40,000 in March. It is predicted that among the early additional producers will be the Stewart, Alameda, and Charles Dickens. The Stewart, owned by F. A. Heinze, has a large amount of ore on the dump.

Cripple Creek, Colorado.

Successful Leases.—Several Strikes of Ore.—Mining on School Lands.—The Isabella Co.—British-American Dividend.—General Activity.

A clean-up has recently been made after a run of three weeks at the smaller of the two Homestake mills on Ironclad hill. The Ironclad Milling Co. has a lease on this plant and is treating ore averaging $3 per ton obtained from the adjacent property. The gold was shipped to the U. S. mint in Denver and was estimated to be worth $5,000.——F. R. Marsh and John Hodges have sold their lease on the Callie to A. E. Humphries and associates, the present operators of the famous Little Clara, which the Callie adjoins. The consideration is said to be in the neighborhood of $10,000, and includes the two ore-houses at the mouth of the Ophelia tunnel and the tramway from the latter to the F. & C. C. tracks.——Good ore is being mined from a block of the Cameron school section on Bull hill operated by the School Section Leasing Co. About four cars per week are shipped giving returns around $30 per ton. The royalties are paid to the school funds of the Cripple Creek district.

The Henry Adney Mining Co. has purchased a 10-drill compressor from the Chicago Pneumatic Tool Co. The machine has arrived in the district and will shortly be in operation on the property. It is of the Franklin type and will be driven electrically. The management is also contemplating the installation of skips, which will materially add to the output of the mine. Ore is being broken on the 500 and 600-ft. levels from a 3-ft. vein and gives returns of several ounces per ton.——A strike of ore is reported on the Twin Sisters claim, which is being operated by J. E. Smith. The ore was encountered at a depth of 80 ft. and enough has been broken for a shipment, the returns from which should be better than an ounce.——It is stated that the Golden Cycle Mining & Milling Co. is about to start its fourth roaster, having a capacity of 100 tons per day. This will make the daily capacity of the mill 400 tons. The Golden Cycle mine is closed temporarily pending the installation of two 2½-ton skips in the main shaft, the former system of hoisting by means of a cage having been found inadequate to handle the output.

At a meeting of the British American Mining Co. Ltd. on the 12th inst. a dividend amounting to $4,000 was declared. This is a close corporation operating the South Dante on Bull hill. The foregoing amount brings the total profits, divided between the partners, to $12,000. The sinking of the new shaft to connect with the workings above the Trail tunnel is progressing rapidly, the shaft now being down 25 ft. Good-looking veinstuff has been encountered in the sinking, but not of sufficient value to be worth saving.——A circular letter has been issued by the Isabella Mines Co. to its stockholders offering 30,000 shares of treasury stock at 25 cents per share for the purpose of liquidating the debts of the company incurred by erecting the cyanide plant, improving the property, and in the payment of $13,000, the judgment in the Glenn case. The annual report of the manager, G. D. Kilborn, is attached. Up to about one year ago the property was worked entirely by lessees. The company itself then started operations, only a few small blocks of ground in the main workings being leased. The output was comparatively large, but the value was low compared with the average grade of the district. As an outcome of this the company last August began building a cyanide plant of a capacity of 150 tons per day to treat this low-grade ore.

The Union Leasing Co. operating on the South Clara D. of the Lexington property is stated to have entered into negotiations with the management of the Portland mill at Colorado City for the treatment of about 50 tons of its ore per day. There are large quantities of ore that will run in the neighborhood of $10 per ton in the lower levels of the mine, the width of the orebody ranging from 15 to 20 ft. A trial shipment to the mill has given satisfactory results. The above leasing company also operates the Mabel M. on Beacon hill, and has resumed work on that property after a shutdown of several days, while a new boiler was installed and various repairs made. At the 300-ft. level of the new shaft at the north end of the claim a good orebody has been opened up, which gives returns of over an ounce.——Good ore is being obtained by A. J. Beckman & Co. on the Lottie claim, block 231 of the Stratton estate on Bull hill. Operations are being carried on only a few feet below the surface and samples from the vein assay several ounces per ton. Sinking is now going on, but a drift will shortly be driven on the vein in a northerly direction to cut a dike, when it is hoped some pay-ore will be encountered.

A strike has been made during the last few days in the Pharmacist mine, situated on Bull hill. The cross-cut being driven in an easterly direction from the shaft has cut a good-looking vein. Samples taken over a width of 3 ft. assay 5 to 6 oz. in gold per ton. The property is at

present under lease to Edsall, Key & Co. of Colorado Springs.——While driving on the 600-ft. level of the Chicken Hawk of the Katinka Mining Co. on Guyot hill, a strong veing has been encountered 300 ft. south of the shaft. The vein is over 6 ft. wide and is believed to be a continuation of the famous C. K. & N. vein, which should cut the Chicken Hawk claim.

Salt Lake, Utah.

Utah Apex Mine.—Transfer at Bingham.—Shipments From Tintic.—Output of Park City.—Railroad Building.—Consolidating Properties.

Late developments in the Utah Apex mine are of a character to give that property a position ranking among the leading copper mines of Bingham. About 100 tons of high-grade ore is being shipped daily. The completion of the Markham Gulch mill within the next few weeks will provide facilities for the treatment of the low-grade ores of the property. The Parvenue adit, which is to be the main exit for ores in the future, has been driven over 2,300 ft.——An Eastern syndicate has closed a deal for the purchase of a control of the Bingham Amalgamated Copper Co., owner of the Copper Glance and Illinois mines, at Bingham, on a basis of $750,000. Payments on the purchase price are to extend over a period of twelve months.

The ore shipments from the Tintic mining district last week amounted to 136 carloads, the shipping mines and respective amounts being: Ajax, 3; Beck Tunnel, 9; Black Jack, 1; Bullion Beck, 4; Carisa, 8; Centennial Eureka, 56; Colorado, 1; Eureka Hill, 3; Gemini, 6; Godiva, 2; Grand Central, 6; Laclede, 1; Lower Mammoth, 6; Mammoth, 10; Scranton, 6; Swansea, 2; Tintic Iron, 6; Uncle Sam, 2; Yankee Con., 4 carloads.—— A merger of the Uncle Sam Con. and May Day mines in the Tintic district has been practically assured. The deal is progressing favorably, and inasmuch as both mines are under the same management there seems no doubt but that it will be completed.—— The Western Pacific tracklayers, who are near the Nevada boundary with steel, have been crossing a large deposit of salt in western Utah. The surface is as hard as a pavement on a city street, and the ties are put down on it, to be followed with gravel ballast.

Ore shipments from Park City last week amounted to 1,780 tons, the leading shippers and respective amounts being: Daly Judge, 752; Silver King, 332; Daly West, 632; Ontario, 114 tons. Nothing of an official character has been released as yet relative to the merger of the Silver King, Keith-Kearns, and other mines at Park City. However, some of the principals in the transaction have been in conference in New York. There appears to be not the slightest doubt about F. Augustus Heinze being interested in the transaction.

Ore is being moved over the tracks of the Rio Grande Western railroad to the bins of the new mill of the Utah Copper Co., at Garfield, and May 10 is set as the date for the starting of the first unit of the plant. In the meantime the work of constructing the second unit is progressing steadily.—— At a meeting of shareholders of the Morrison Mining Co., in Salt Lake, the name of the corporation was changed to that of the Imlay Copper Co. The capital stock of the company was also increased from 300,000 to 400,000 shares. S. M. Bamberger, of Salt Lake, is manager.

Graders are pushing work rapidly on the new branch line of the Salt Lake route from Caliente to Pioche, Nevada. The track-layers will follow the graders closely. —— The Moscow Extension Mining Co. has been formed to operate the Russell group of claims in the Star district, Beaver county. Preparations are being made to resume production at the Burning Moscow mine in the same county. A permanent working shaft is being sunk; this is now down 235 ft., and will be continued to 300 ft. The Frisco Contact Mining Co. expects to encounter shipping ore soon in the drift being run toward the contact on the 500-ft. level.—— The mill at the property of the Jennie Mining Co., at Gold Springs, Iron county, is said to be a complete success, and is handling an average of 30 tons of ore daily. C. A. Short is manager.—— The head offices of the Nevada Hills Mining Co., operating at Fairview, were ordered moved to Salt Lake at the recent meeting of shareholders held at Goldfield, Nevada.

London.

Rio Tinto.—A Splendid Record.—Tremendous Operations.—Zinc Corporation Changes.—The Rival Processes.—Cornish Mining.—Public Interest Not Maintained.

The last annual report of Rio Tinto is a fine record of continued prosperity on a magnificent scale. At the thirty-fourth ordinary general meeting of this Company, held this week, the chairman said the net profits for 1906 amounted to £2,171,267, which enabled the directors to declare a final dividend for the year of £3 per share, making, with the interim dividend, 11½% for the year. Increased profits have come from the higher price of copper, and also a good additional profit from a larger quantity of ore sold for its sulphur contents. Economies have partially neutralized the increased expenditure of nearly £100,000, caused by the rise in Spanish exchange, but Spanish, French, and English taxes again increased, and were £300,000 higher, joined with a further drop in securities, chiefly Consols. The large screening plants have done well in the past year, the railway and pier handling practically half a million tons of sulphur ore, in addition to the cupreous ore hitherto carried. The water supply at the mines, owing to dry seasons, has been giving trouble, and reduced water consumption may mean a reduced output of copper, although one summer's scarcity of water merely postpones profits for a few

Eastern Australia.

months. The chairman added that industrial enterprise was active in all countries; copper was, therefore, in great demand, and all new machinery and ships needed copper in a greater or less degree. It was rapidly becoming realized that it is more economical to create power at centres in large units, and distribute by electric current, than the use of numerous small steam-engines working locally. This had, even in heavy railway work, gone beyond the experimental stage. Probably, therefore, the electrical age had hardly commenced; and even if new sources of supply were found, their copper would continue to fetch remunerative prices.

The past year was by far the most prosperous in the history of Rio Tinto, which dates from 1873, although the first dividend was paid for 1879. In the following table are shown the profit earned and its distribution in the past three years:

	1904	1905	1906
	£.	£.	£.
Profit on produce	1,667,530	1,845,291	2,414,582
Interest on investments	22,196	20,973	20,979
Railway receipts	18,945	25,748	29,857
Rents, &c	5,836	8,527	10,176
Gross profits	1,714,507	1,800,539	2,478,594
Brought forward	20,189	27,480	26,953
	1,734,696	1,928,019	2,505,547
Administration	77,791	83,486	98,414
Income tax &c	163,933	130,075	168,974
Debenture and other interest	198,661	159,429	.....
Written off	49,559	47,889	61,892
To reserve, &c	2,500	3,000	5,000
Preferred dividend (5%)	77,272	77,187	77,187
Ordinary dividends	1,137,500	1,400,000	2,062,500
Rate per annum	70%	80%	110%
Carried forward	27,480	26,953	31,580
Copper produced, tons	33,478	32,280	34,098
Average price	£59 0 5	£69 12 0	£87 9 3

Since the Company commenced to pay dividends, in 1879, the total distributions, with those to be shortly made, will have exceeded £18,365,000, while the undertaking has a present market valuation of close upon £40,000,000. For each of the three years ended with 1904 about £200,000 had to be set aside for debenture interest and redemption and general interest; but in the early months of last year 4% first mortgage bonds, amounting to £2,989,740, were paid off, so that for the past year there is no payment for interest. The requisite funds for the extinction of the debentures were provided for by the issue of 50,000 Ordinary Shares of £5 each at the price of £63 each, providing £3,150,000, reduced to £3,103,158 by the expenses of issue and the Spanish tax on the extinction of bonds. In other words, with a nominal increase of £250,000 in the share capital the Company's liabilities have been reduced by £2,989,740, and this sum being brought into the accounts has made it possible to write down very considerably the amount at which the mines and inert assets in Spain stood on the property and assets side of the balance-sheet. In the course of the past twelve months the total amount of pyrites handled at the mines was 1,923,716 tons of an average copper content of 2.411%, as against 1,830,104 tons with an average of 2.363% in the preceding year, while the copper produced during the year by treatment at the mines was 21,827 tons, in contrast with 19,530 tons, and the amount of fine copper in the pyrites shipped brought up the total output to 34,098 tons, comparing with 32,280 tons in 1905. The deliveries of sulphur ore, which had been 157,850 tons in 1904 and 308,184 tons in 1905, rose last year to 477,843 tons.

The following important cable is announced from the Zinc Corporation's Melbourne office: "After thorough examination and trial of A. Queneau's system of treatment, we have come to the conclusion that it is not commercial success; however, we have altered one unit to Cattermole process, and have proved success of Cattermole process system of treatment. We are obtaining good extraction lead and zinc from all materials, including slime, and are producing and shipping concentrate of good grade. We have abandoned A. Queneau's system of treatment, and are altering balance of No. 2 plant to Cattermole process. We should be running full time, 500 tons per day, in about a month. In the meantime running one unit on Cattermole process, treating 140 tons per day." In the opinion of the *Mining World*, it is doubtful whether the decision in the Supreme Court of Victoria in favor of the Broken Hill Proprietary Co., against which the Potter Process Co. had brought an action for alleged infringement of patent rights, will be allowed to pass unchallenged. The issues at stake are too great to admit of the matter remaining where it is, a verdict in favor of the plaintiff involving the payment of royalty on the vast quantities of zinkiferous tailing owned by the Company. The Potter salt-cake process for the extraction of zinc from the Broken Hill sulphide tailing is the property of a company having a capital of £250,000. The royalty charged for treatment is 2s. 6d. per ton, which, if paid by the Proprietary Co. on its accumulated tailing would approach something like £750,000. The Delprat process, adopted by the Proprietary Co., resembles the Potter in several respects, but not sufficiently, according to the Supreme Court judgment, to constitute an infringement of the Potter patent. In the Potter salt-cake process the tailing is poured into vats of peculiar shape and construction, and containing a prepared solution of sulphuric acid, diluted to 1%, the result being that the metallic particles are attacked by air globules, to which they become attached and float to the surface, where they are collected. There are several other processes worked at Broken Hill, including one in which the zinc particles are electrically attracted from the gangue, and another in which the valuable constituents are absorbed by a master absorbent and subsequently separated; also the Bavay process, in which the metallic particles are aerated and floated off. Thus there is apparently a general resemblance in the various processes, but improvements are so frequently made that a more perfect and cheaper method may yet be devised.

Cornish mining requires a stimulus of some sort just now to prevent the waning of public interest, which, it must be admitted, has scarcely come up to expectations. At the same time a certain amount of attention is being given to the resuscitation of old mines, which should result in a show of some kind before long. It is rumored that Great South Tolgus, West Tolgus, and Wheal Eddy are to be worked by a single company, and that arrangements are now being made for the opening of these three mines. Wheal Eddy is situated at Tolskithy, and Great South Tolgus and West Tolgus are to the east of it. The main Wheal Agar lode, it is said, runs through Wheal Eddy sett. These mines were originally worked for copper, and sixty years ago Great South Tolgus £10 shares were worth £140 each. Any of the ancients who still survive those times are doubtless prepared to inform newcomers that in each of the properties mentioned "a fine lode was left in the bottom." Operations are reported as being carried out with great energy at the Tywarnhaile mine. The mill and concentrator has been running constantly for several weeks, and the first lot of copper concentrates from the old dumps ('burrows') is now being carted to Portreath for shipment to Swansea. The concentrator continues to do excellent work, and the ratio of concentration is at least 20 to 1. Both the mill, concentrator, and pump supplying the water for the mill are motor-driven. Within about a month the mill ought to be running steadily on ore taken from the mine.

Cobalt, Ontario.

Prospecting in Northern Ontario.—How Claims Are Obtained.—A Prospector's Paradise.—Chances of Discovery.—Recent Finds.

The phenomenal results attained by development in the vicinity of Cobalt, where practically within two years 18 properties have been put on a shipping basis and 16 others are ready to ship, has led to the prospecting of an extensive area in northern Ontario hitherto not even known by name except perhaps to war veterans who have had their claims or lots allotted to them in this unsettled region. These lots, or 160-acre claims, are exempt from location, but otherwise this vast territory is open for location and development.

Cobalt having been found by a chance discovery, is it not reasonable to suppose that many other districts may be discovered by systematic prospecting? This argument is the great theme at Cobalt and is the chief incentive for prospecting this unknown region. No doubt many valuable discoveries will be made and many good mines developed, for the whole country about here is well mineralized and contains most of the useful metals.

In Cobalt, mines and mining engineers are made over night. A chance discovery of a blind vein will convert a prospect into a shipping mine, and the management of one of the many properties in the vicinity will convert a farmer into a mining engineer.

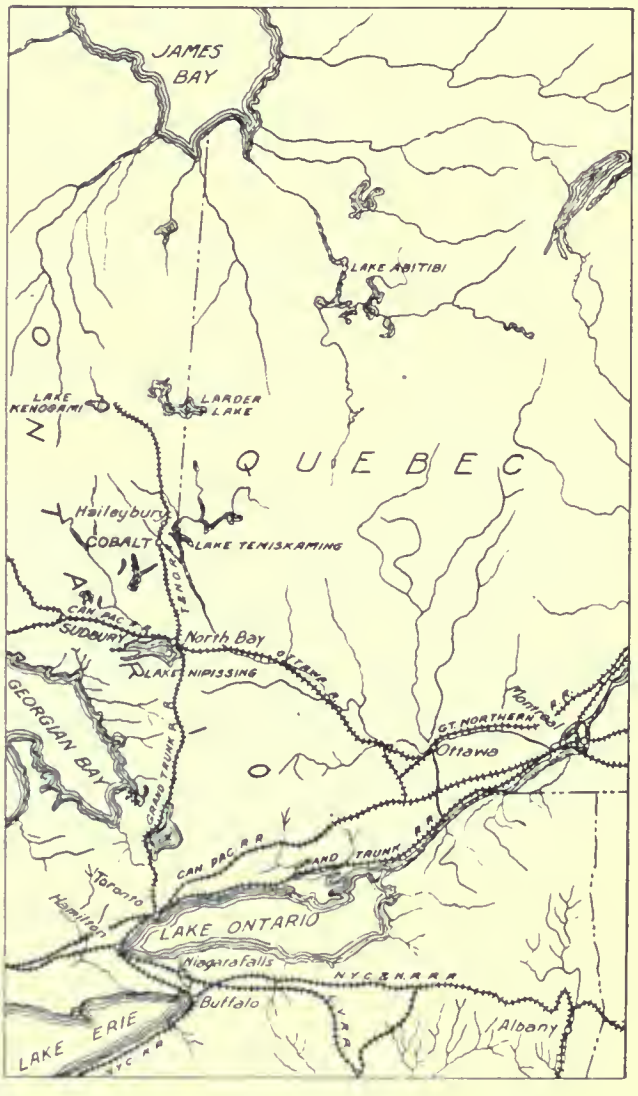
Most of the shipping mines being in Coleman township, the 1,500 or more claims outside of those already proved to contain shipping ore, are valuable according to position in respect to such claims, to whether they have been simply recorded, passed, or patented. A staked and recorded claim is a claim (20 acres in the surveyed portion of Coleman township, or 40 acres in any other locality) that has been properly staked, with a discovery of mineral in place, that has been sworn to and recorded at the Recorder's office. A 'passed' claim is one on which the conditions have been fulfilled and the discovery passed by the Mining Inspector, although this does not signify that the mineral discovered is of any commercial value, it means only that the Inspector is satisfied of a discovery of valuable mineral in place.

A claim with a 'working permit' means that after the claim is recorded a permit is applied for and granted, which gives the licensee the exclusive right to prospect for mineral, and the licensee shall perform mining operations thereon for at least five days in each week during the six months next following two weeks after the issuance of such working permit, or an equal amount of work in less time, the time from the fifteenth of November to the fifteenth of April excluded. A 'patented' mining claim means a claim on which all the conditions required by law has been performed and a patent granted by the Government, whereby the patentee has exclusive right to all mines and minerals thereon, but no lands shall be patented for mining purposes in any forest reserve. No licensee may record more than three mining claims in any one year.

Recorded claims in Coleman on which nothing has been found can be bought for $350. This same claim with a working permit will sell for $1,000; if passed by the Inspector, it will fetch $10,000, so that with good luck there is money to be made prospecting claims for a good discovery that can be sold. The amount of work required is a matter of chance, for the ground being, as a rule, covered with 4 to 16 ft. of sand and gravel, it must be blindly trenched, and any streak of calcite followed, along its strike or downward, until the showing is sufficient to pass inspection. This may cost from a few dollars to many thousands. It may naturally be asked whether any claim with no showing at all on the surface has turned out to be of value. The answer to this is decidedly in the affirmative; in fact, many claims that have shown nothing of value in the trenches have developed rich ore on sinking.

This region is the prospector's paradise. He is almost certain to be rewarded, at least, for his time. The country is easy of access, food comparatively cheap, and walking good; that is to say, the country is mostly level or rolling, with no high ranges of mountains or deserts to cross. The winters are severe but easily endured, the summers short, hot, and bothersome with flies and mosquitos.

Staked claims to the east of Cobalt, near rich discoveries, sell for $10,000 to $50,000, and if passed they bring as much as $5,000, although no ore of a sufficient value to ship has been discovered. Valuable discoveries of silver-bearing calcite have been discovered outside of Coleman; in Bucke, where at least one mine is shipping rich ore and others are ready to ship; in Casey, Harris, James, and many others within a radius of 50 miles of Cobalt. The Montreal River district and other townships north of Cobalt have not had the advantage of summer prospecting, most of the work having been done this winter with four feet of snow and the thermometer many degrees below zero, so just what this year will bring forth is uncertain. Gold is being discovered from Larder lake north into Abitibi, 50 to 100 miles north of Cobalt, but little work has yet been done to prove the extent or value of the discoveries. No doubt some good mines will be developed with a horde of wild-cats close on the trail.



Map Showing Position of Cobalt and New Districts in Ontario.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

DUTCH GUIANA produced 28,272 oz. of gold in 1905 and 31,332 oz. in 1906.

IN the early days of tunneling, machine drills were mounted on cars running on tracks, and this is still the practice in some parts of Europe.

BY subjection to the action of carbon dioxide and water, orthoclase may alter to muscovite or kaolin, which action is accompanied by the production of potassium carbonate and silica.

THE most famous South African diamond mines are at Kimberley, De Beers, Dutoitspan, Bulfontein, and Wesselton. These are in a circle about three and one-half miles in diameter.

SEDIMENTARY CLAYS can be distinguished from residual clays chiefly by their stratification, and also by the fact that they commonly bear no direct relation to the underlying rock on which they rest.

WITH the hydrates of sodium and potassium in great excess, salts of cobalt give a liquid of a very intense blue color, especially when heated. This blue liquid is an alkaline solution of cobaltous anhydroxide.

THE gold deposits of the southern Appalachian States are of pre-Cambrian age; so also is the schist in which the Homestake lode occurs. The copper deposits of Grand Encampment exist in rocks of similar age.

THE amount of water used on vanners, varies in different mills, from three to eight gallons per minute per vanner. This includes the water fed with the pulp and the cleaning jets above and below. Clayey, talcose, slaty, and calcareous ores require more water than quartz ores.

CONCRETE is a troublesome material in which to drill deep holes; it is a good plan to use water under pressure, with a wide flare bit, permitting a small copper waterpipe to be inserted nearly to the bottom of the hole, so that chips and dust are carried off before they can wedge the bit.

THE most persistent beds of marine clays, which are sedimentary clays deposited on the ocean bottom, where the water is quiet, occur in the rocks of the Silurian, Devonian, and Carboniferous systems, but beds of considerable horizontal extent are found in the Mesozoic formations.

THE best thickness of bed on the ordinary side-shake vanner is about one-fifth of an inch, measured over the small rollers, and should probably never exceed one-quarter of an inch, although the thickness of the bed should be made dependent upon the size of the individual grains being treated.

IN the Tintic silver-lead-copper mining district, the most common form of chemical alteration is the substitution of silica for lime, which, when complete, forms jasperoid. The jasperoid is often intimately associated with the ore, and also forms large bodies which contain little or no valuable mineral.

AMONG the more recent applications of fluorspar to new uses are: In the reduction of aluminum from bauxite; as a flux for gold ores; as a bonding constituent for emery wheels; for carbon electrodes, increasing their lighting efficiency and at the same time decreasing the amount of required current.

DETONATORS for exploding dynamite consist ordinarily of a mixture of mercury fulminate, and potassium nitrate or chlorate, placed in a copper capsule; when the cap is to be fired with a fuse, the fulminate is covered with shellac, collodion, thin copper foil, or paper, and the end of the capsule is left open to receive the end of the fuse.

SERICITE-SCHISTS are mica-schists whose mica is sericite. Mica-schists embrace a wide series, ranging from rather coarsely crystalline varieties to others that are very fine-grained and are almost slates. If the latter, when the mica is in aggregates of a silvery white color but of the composition of normal muscovite, the mineral is called sericite, and the rock a sericite-schist.

AT Butte, Montana, occur two granites of different ages, one of which is about 10% more silicious than the other. The less silicious granite contains hornblende and biotite, while the other contains but little. The fractures along which the ore-bearing solutions passed cut both these granites, but the veins are rich in copper in the less silicious granite, while in the more silicious rock the veins are equally wide and strong, but are lean, and composed chiefly of quartz, with comparatively little pyrite and copper.

FILTRATION as usually carried out, is the separating of an insoluble substance from the liquid in which it is suspended. This can be done by means of a porous medium, or filter, of such material as not to be attacked by the substance to be filtered, and which is sufficiently porous to allow the liquid to pass through it, while coarse enough to retain all solid matter. Many different filtering mediums have been used, such as linen, woolen, and cotton fabrics, felt cloths, straw, raw cotton, coarse and fine sand, burnt clay, animal and vegetable charcoal, soft leather, unsized paper, crushed glass, sand, asbestos, and platinum sponge.

A PIECE OF METAL is not a homogeneous single thing. It is a collection of grains or granules that built it up just as granules built up a glacier. The grains of metal are irregular in shape and unequal in size. Their existence is revealed by polishing and etching the surface of the metal and examining it under a microscope, when the grains can be readily distinguished by differences of texture and the boundaries between them can be clearly traced. Investigation shows that each grain is, in fact, a separate crystal, and the irregular boundaries are due to casual inequalities in the rates at which the various crystals have grown during their formation.

MANY sedimentary clays, especially those of marine origin, after their formation, are covered up by many hundred feet of other sediments, due to continued deposition of a sinking ocean bottom. It will be easily understood that the great weight of this overlying sediment will tend to consolidate the clay, by pressure, converting it into a firm, rock-like mass, termed a shale. That the cohesion of the particles is due mostly to pressure alone is evidenced by the fact that grinding the shale and mixing it with water will develop as much plasticity as is found in many surface clays. An additional hardening has, however, taken place in many shales, due to the deposition of minerals around the grains, as a result of which they become more firmly bound together.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Gold Dredging.

The Editor:

Sir—In your issue of November 3, 1906, Mr. D'Arcy Weatherbe discusses gold dredging, with special reference to Mr. Curle's letter on the same subject in the issue of January 27, 1906. In the closing portion of Mr. Weatherbe's letter, he refers to a letter of mine of July 28, relating to the same subject, and advances some criticisms thereon.

While in no way wishing to decry the valuable contributions of Mr. Weatherbe concerning California dredging, I must admit that I fail to see much force in the last portion of his letter. I have not seen, as yet, from Mr. Weatherbe or others, a specific answer to my question in the issue of July 28, as to the cost of dredging. For the present I leave this point open.

Mr. Weatherbe objects to the "generalization" that flood-plains are the proper field for gold dredging. He answers my statement by an unsupported generalization of his own that "Neither the territory on the Yuba where the river bottom, with its accumulation of tailing overburden, forms the gold-bearing material, nor the bench gravels of the American river at Folsom, together forming probably half (in value) of the available fields, come under this head."

I hope to support, in the following, the view that both the areas referred to are typical examples of "flood-plains reduced nearly to base-level." Before proceeding, I wish to make the comment that notwithstanding the number of highly-trained men now engaged in the examination of dredging conditions, and in the prosecution of the dredging industry, geological factors have not been taken sufficiently into account in selecting the ground. I crave space to insert here once more a description of what I believe to be the essential conditions for a dredgeable territory.

"Taking the country about Oroville, California, as the best example in the United States, let the geological conditions be considered. To the north and east the erosion of a vast extent of mining country, whose rocks are penetrated by gold-bearing veins, has contributed little by little through geological ages to the mass of detritus now occupying the bed of the Feather river. The wearing down of mountains (originally very much higher than at present) through a vast amount of time, has caused the formation of a valley of extraordinary width, but of no great depth. The massing of stream detritus is also responsible for a decrease in the gradient and a slowing down almost to a topographical equilibrium of the formerly swift current of the river. The stream, unable under the conditions to cut its way by virtue of the material which is carried in suspension, has for a long time been depositing its load, filling its wide valley with sand and gravel, together with the less destructible of the metallic particles, and notably gold. Geologically speaking, the rate of deposition of the river's material may be said to be on the increase and the current of the river, still of considerable velocity, to be greatly lessening in swiftness. Later in its geological cycle the Feather river will doubtless assume, on a smaller scale, the present character of the Mississippi, forming ox-bow curves, cut-offs, and as it were, losing its way among constantly shifting sand-bars. The accompanying residual gold, as it travels to a greater and greater distance from its original source in the veins of the mountains, becomes more and more finely divided, even to microscopic dimensions, and increases in purity, and the degree of evenness with which the particles are distributed in the gravel becomes a phenomenon of constantly increasing definiteness and importance.

The Country Around Oroville, California.

Such a set of conditions as that obtaining on Feather river is the exception rather than the rule in the western part of the United States, and even in California. The above explanation has been entered into in order to present in some measure the reason why, on the California river referred to, the conditions are not only favorable but eminently suited to gold dredging. It is hardly necessary to state that the amount of gold increases in geometrical ratio the lower it lies in a given bed of gravel. Thus old rather than young valleys are favorable for dredging.

Additional reasons of great weight why geologically old valleys should be looked for are that the size of boulders is greatly decreased, gravel becomes by long abrasion uniform in size, the angularity of the fragments disappears, and a bed of pebbles, round and easily handled, is the

result. The even distribution of the gold which, as mentioned above, is an invariable accompaniment of old and wide valleys, is a point in favor of this sort of mining, looked at from the standpoint of a business enterprise. At the same time it is evident that the finely divided state in which such gold is found necessitates the highest skill in recovering it."*

The above description was written before the Yuba and American river areas had become prominent for dredging. These areas are not different in geological history from the Feather river dredging area. In fact, I believe they would be classified by any geologist as part of the same general base-level. The Yuba river, 12 to 16 miles east of Marysville, has a gradient of less than 50 ft. per mile. It flows in extensive gravel and silt-filled plain. The fact that 25 ft. of tailing from former operations covers the plain in and near the river-bed is an incident of artificial origin, which has accentuated the natural base-level conditions previously imposed. Mr. Weatherbe perhaps means that the gold exists in the bottom of the Yuba river by virtue of the tailing that covers the gravel deposited in the natural way. If this be the case, I admit that a special condition exists, but as it has no bearing on the geological conditions, it does not constitute a refutation of my contention. On the other hand, my understanding has always been that the Yuba gold occurs mostly in the undisturbed gravel beneath the tailing. If this be true, it is as surely the gold of a flood-plain as is that of the Feather river.

The deposition of fine alluvial gold in great river valleys by floods and periodic innundations may be called flood-gold. No one can say in what portions of a given broad valley the local currents will deposit such fine gold. The result must be that the flood-gold occurs in patches distributed irregularly over a wide area. On the Yuba I believe it is a coincidence that one such patch, determined by prospecting, lies in the area crossed by the present river-channel. Similar patches will be found over a greater area than that at present exploited.

As regards depth, wells at Wheatland on the Bear river, a part of the same great base-level, went through 150 ft. of gravel, clay, hard-pan, sand, and a further 300 ft. of greenish sand, all of Tertiary or late Cretaceous age, and it is fair to assume the same depth in the Yuba. Gold may exist throughout this depth in various layers. By any present method it is unrecoverable.

Messrs. Becker, Lindgren, and Turner, in the Smartsville folio of the Geologic Atlas, July, 1895, state, regarding the Yuba valley: "The present system of watercourses is steadily degrading the older formations and depositing the sediment on flood-plains forming bottomlands of greater or smaller extent or alluvium." The elevation that occurred in Pleistocene time and which affected the American river area thirty vertical feet or more, may have had some influence along the Yuba, and even the very moderate grade of stream was probably less than at present. The river is at present doing but little cutting, except in the way of removing its artificial load. The present dredge-tailing is rapidly removed and re-deposited further down the stream, when the current of the river comes in contact with it. I witnessed an impressive illustration of this cutting away during a season of high water on the Yuba, in October, 1904. As far as the Yuba valley is concerned, I think it would be difficult to find a fairer example of a flood-plained stream reduced nearly to base-level.

The area of bench-gravel now being dredged adjacent to the American river at Folsom offers the conditions of an ancient base-level raised slightly over 30 ft. above the present level of the stream that is reducing it. The elevation af Folsom does not exceed 140 ft. above the sea, and the gradient of the American river is less than 25 ft. per mile. The fact that the auriferous patch of gravel, which is being dredged, lies in a low bench, means in this case that the cycle of base-leveling has been completed, and that the terrane has undergone a slight elevation, and is again being disintegrated. It has not only been reduced to base-level, but has, as it were, been lifted up for exhibition, to show what a base-leveled flood-plain should look like.

Mr. Weatherbe has shown us that he knows a great deal about dredging operations in California. He will, I am sure, pardon this protest from a geologist who has endeavored to apply scientific principles to the search for dredging territory, and he will recognize that there may be ways of determining what ground presents dredging possibilities, undreamt of in his philosophy.

C. W. PURINGTON.

London, March 11.

*"The Gold-Dredging Fields of Eastern Russia," by C. W. Purington and J. B. Landfield, *Engineering Magazine*, 1901, p. 398.

The Salton Sea.

The Editor:

Sir—In your issue of March 30, Wm. R. Bailey ridicules the idea that the Salton Sea can in any way influence the rainfall or the climate of Nevada and of the territory east from there. He speaks of the evaporation from the Gulf of Mexico and from the Gulf of California, and asks why the country in the neighborhood of the Gulf of California has not been flooded. His reasoning seems to be that the nearer to a large body of water the greater the rainfall. At Cape St. Lucas, on the extreme end of Lower California, the rainfall is almost nil, yet Cape St. Lucas is next to the Pacific Ocean and to the Gulf of California.

The heavy rainfalls throughout the world occur in the mountains and not on the coast. The factor of evaporation is secondary to, and of minor importance compared with, the conditions favorable to precipitation. The air may be humid, but until something happens to cause the vapor to condense there will be no rainfall. The clouds from the Pacific Ocean are wrung dry in their drag east across the Sierra Nevada, so that by the time they are over the great plateau between the Rocky Mountains and the Sierras they have but little available moisture for rainfall. Likewise the winds from the east in crossing the Rocky Mountains are chilled and their water is condensed as rain, to flow eastward into the Mississippi. The winds in the great plateau are usually drying winds which pick up moisture rather than give it up as rain. The conditions for precipitation in that arid region are good, except that at most times there is not enough surcharge of water in the clouds available for precipitation. The ground gets heated during the day, causing a warm current of air to rise, and this, if humid, would—on meeting the colder currents above—be chilled and cause a condensation, with probable rainfall. The rainfall from such condensation can often be observed on the desert, although no rain may reach the ground. A comparatively cool dry air stratum forces its way below the warmer air and absorbs the rain as it falls, before it reaches the earth.

A. P. Davis, chief engineer of the U. S. Reclamation Service, estimates that the Salton basin would receive annually from the Colorado river about 8,000,000 ft. of water per acre and he allows that evaporation would be seven feet in depth per year. At that rate the Salton basin would never fill. With an inflow of 9,000,000 acre-feet and an evaporation of six feet per year, it would take from forty to fifty years to fill the basin so that it would have an outflow to the Gulf of California.

The Colorado river is one of the largest rivers in the

United States. It is over 1,100 miles long, exclusive of its tributaries. With Green river, its northern tributary, heading near the Yellowstone Park, Wyoming, it has a length of 2,000 miles. The Colorado watershed is over 250,000 square miles, a territory equal to the combined areas of the States of California and Colorado. It is impossible to determine accurately the rainfall of this watershed, but the run-off of the Colorado river represents 20% of the total rainfall. If this water of the Colorado is allowed to evaporate in the Salton basin, it will mean that much more moisture available for rainfall in that area, and such water will evaporate, to fall again and again as rain in a never-ending cycle. As the winds cannot get into the desert without first leaving their excess of moisture in their drag across the mountains, neither can they get out again without leaving the water on the plateau or on its many mountain ranges. To what extent this will increase the rainfall no one can say, but it is more than probable that it will affect it to an appreciable extent.

Mr. Bailey speaks of the rainfall of 1884. In November, 1883, I rode a mule across the desert by way of Yuma, New River, Indian Wells, and afterward on to San Diego. It was very wet at that time. We camped two weeks under a mesquite tree near the Salt river, Arizona, waiting for the rain to cease, but finally we broke camp in the rain and rode on. It rained nearly every day until we reached Indian Wells in the Imperial valley. The New river showed signs of a recent overflow. There were salmon and other fish in the lagunas and at Indian Wells on the lake we found thousands of gulls and wild ducks. We killed ducks nearly every day on the trip. Southwest from Yuma, along the Colorado river, for miles we rode through an immense water-melon patch, formed by seeds distributed by the Colorado overflow. We were told that the Colorado river had overflowed the season before into the New river.

ALBION S. HOWE.

San Francisco, April 5.

Black Sand.

The Editor:

Sir—Having read your editorial on 'Black Sand,' in a recent issue, and being very much interested in this matter, I should like to record my experience. It is not my intention to begin an argument, but to make just a simple statement of facts. My first experience with fine gold and black sand came three years ago when I was associated in the operation of some placer claims on the head of Clarks creek, in Josephine county, Oregon. The bank was high, easily washed and the machinery (while I believe it could have been improved) was as complete as those in ordinary use for placer mining. I believed that the bank contained a value of ten cents per yard, with large quantities of black sand, amounting to from one tenth of one per cent to from three and one half to four per cent of the mass, giving an average of about one half of one per cent throughout. The clean-up was unsatisfactory, and the difference between our expectation and realization led us to investigate the matter. We placed a settling-tank under our apparatus and saved the sand from the clean-up, amounting to some hundreds of pounds, and sent a sample to Baker & Co., of Newark, New Jersey, for a test, from which they gave us a return of 35 oz. gold and 5½ oz. platinum. This led me to the conclusion that by two operations of this separation, the first consisting of separating the black sand from the pulp, and then making a final treatment of the black sand, it would be possible to make a good property out of an indifferent one, and I decided to devote my entire attention to accomplishing this result, or satisfy myself of the impossibility or impracticability of my endeavors. With this aim in view I visited a number of localities to find the one best adapted to an operation of this kind, and the one that would prove the most valuable in case a success resulted. And I am satisfied that I examined property now standing idle and considered of no value, that were they supplied with proper equipment, and this equipment properly adjusted, and the same judgment used that is often necessary to make the operation of a quartz proposition satisfactory, the results would be surprising.

I will give two illustrations. I wished to secure one ton of black sand to get an idea of the cost of securing it, and to prove the possibility of securing sand in large quantity. The cost of labor, supplies, etc., to secure this amount was $180. The rig was very crude and included the cleaning of the sand in a hand-pan. I separated all the gold possible, and a much larger amount than is possible on a larger scale, spreading the water over a wide surface covered with burlap under a screen. This I cleaned up frequently. The result of this experiment showed $43 in gold and one ton of sand that gave an average of $51 in gold from twenty-eight tests made, with platinum and nickel in such quantities that I cannot demonstrate the possibility of their profitable extraction.

In another case I had three tests made on a beach deposit. Samples were taken on a shovel without concentration. No. 1 fire test, $3.60 per ton, in gold; No. 2, fire test, $3.15; No. 3, amalgamation test, $2.40. This deposit is six feet thick and is 20 acres in extent to my knowledge and the indications are of a much greater area with possibilities of greater depth.

I do not believe that any exaggerated claims or misstatement of facts will help us to solve these problems, and if there is no future possibility of successfully separating the metals that are deposited with and go with the black sand, the quicker we know it the better, and I would be very glad of any light on the subject from the readers of the MINING AND SCIENTIFIC PRESS.

L. A. MAXWELL.

Crescent City, Cal., April 5.

GYPSUM IN CALIFORNIA.—There are now four gypsum mills in the State, one at Amboy, one at Los Angeles, and two at Palmdale. Of those at Palmdale one is still in process of construction. The product of these mills is consumed in the State. It is used mostly for wall plaster, but a smaller amount is ground for fertilizer. Generally speaking, the gypsum runs from 54 to 90% pure. Deposits occur, however, in the form of alabaster, which are very pure and are suitable for the manufacture of plaster of paris, but they are far from railroads, and so at present they are unavailable. The deposit at Amboy is found in the middle of the Mojave desert, along the tracks of the Santa Fe railroad. The plant is situated near the bed of an old lake, around the edge of which the gypsum has been deposited.

Gypsum sets quickly, usually in about five minutes. Because of this, a retarder often consisting of slaughter house refuse, dried and powdered, which delays the setting from 50 minutes to two hours, is employed. There is nothing peculiar about the California gypsum, as distinguished from that of other localities, except the fact perhaps that at one of the plants it is necessary to re-grind the gypsum after calcining it. California producers are fortunate in being able to use oil as a fuel in their gypsum mills. Not only is it a cheaper fuel than wood or coal, but it is better suited to the exigencies of the work, as the heat of an oil flame can be more easily and quickly graduated than can that of furnaces burning wood or coal

The Geology of the Veta Madre.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

An idea of the general geology of the Guanajuato district is obtainable along the road that crosses La Bufa. I went this way to the Peregrina mine, seven miles from the city of Guanajuato, and incidentally formed my first notions concerning the country enclosing the Veta Madre.

The accompanying cross-section (Fig. 1) I owe to Señor Ponciano Aguilar, of the Mexican Geological Survey. It illustrates the fact that the Veta Madre follows a fault of big throw, so that the foot-wall is shale[1] and the hanging a series of layers of volcanic fragmentary material. The magnitude of the fault that made the Veta Madre is clearly indicated.

The Miocene agglomerate of the hanging wall, usually called the 'red conglomerate,' or Guanajuato formation, is overlain by breccia and rhyolite tuff, termed 'sandstone' by the *outlanders*, while the Mexican geologists call it *lozas*[2]. Then comes more agglomerate and then tuff, the latter a succession of layers of volcanic fragmentary material, altogether 1,200 ft. thick, and reminding me of the formation that prevails in the San Juan region of Colorado. On the further edges of the eruptive centre these clastic rocks are replaced by lava flows, of dense rhyolite. The foot-wall of the big lode, as seen in this section, is Miocene agglomerate, and different from the foot-wall rocks north of the Sirena mine; the change of formation being due to a cross-fault coming into the Veta Madre on its foot-wall side, producing a down-throw of the southern portion of the foot-wall rocks. This is illustrated in the accompanying drawing (Fig. 2), made from a sketch given me by Mr. R. H. Burrows, an experienced economic geologist, resident at Guanajuato. The Sirena mine is indicated at *A*; at *B*, the approximate relative position of the Valenciana mine, the throw is at least 6,000 ft., while at *C*, the place of the Cedro mine, the throw is probably 2,000 ft. The difference in throw is not effected by bending of either side of the Veta Madre, but by step-faults.

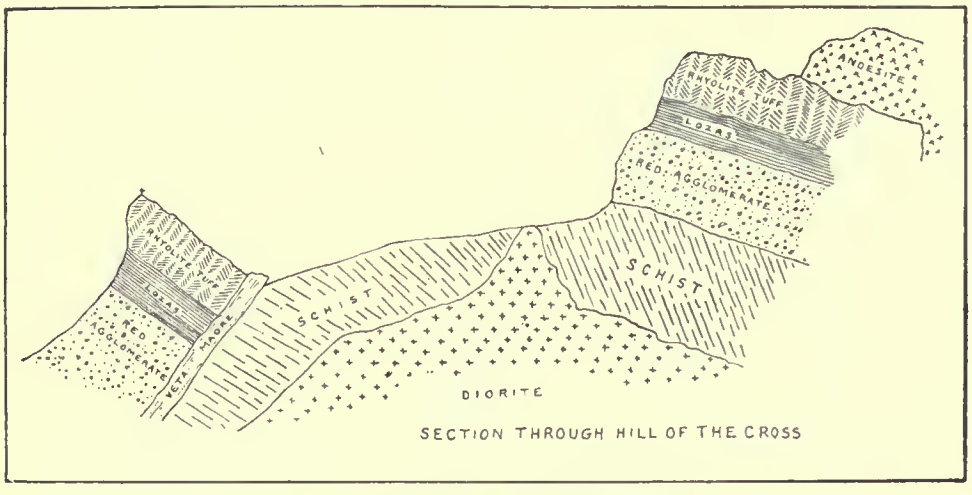


Fig. 1. Cross-Section of the Veta Madre.
After Ponciano Aguilar.

Northwest of this cross-fault it is difficult to determine the extent of the displacement along the Veta Madre, because the relation of the agglomerate to the shale has not been established. After the lode passes through the southeast of the cross-fault, the throw can be determined by estimating the distance from the top of the red agglomerate on the hanging-wall side to the top of the same formation on the foot-wall side. This distance is shown in the section *B B*, in Fig. 3, where it is represented as 2,000 ft. Referring to the section *C C*, there is no formation now in contact above or below the shale, and the bottom of the red agglomerate is nowhere visible. As the shale is older than the red agglomerate, the throw will be represented by the known thickness of the red beds, plus the amount of the latter that has been eroded on the foot-wall side of the lode. Of these two factors, which together make up the sum of the throw, only the first mentioned is definitely known. Starting downward from the top of the red agglomerate on Sirena Mtn. this formation is traced all the way to Marfil, a distance of six miles, exhibiting a constant strike and a dip varying from 5 to 30° east. The thickness thus represented is fully 6,000 ft., so that, omitting the other factor, it is well within the mark to estimate the throw at 6,000 feet.

At the Sirena mine, the foot-wall is shale (probably Cretaceous), varying from argillaceous to calcareous, from clay to lime. On the hanging the layers of agglomerate dip eastward toward the lode. The agglomerate becomes deeper as one goes southeast along the outcrop of the Veta Madre; it feathers out to nothing at the Valenciana, and at Bustos it is about 200 ft. below the bottom oe the valley. The slope taken at right angles to the strikf of the Veta Madre, is about 30° downward and toward the vein, the strata therefore making an angle of approximately 75° with the dip of the Mother Vein. The dip of all the bedded rocks in the district is about due east-west, and the strike of the lode is northwest-southeast. It is not a simple vein, but a vein-system within a zone 50 to 600 ft. wide. The principal orebodies in the Sirena mine occur near the intersection of the Amparo vein coming in from the hanging wall. Much the same is true of the orebody in the Rayas mine, formed at the intersection with the Santo Toribio vein, which also comes into the main lode from the hanging-wall side, the ore pitching with the line of this intersection.

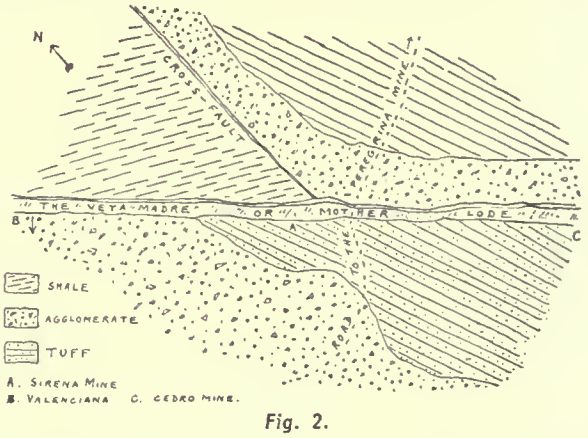


Fig. 2.

At the time of my visit, the Sirena was in bonanza; a new orebody had been found on the fourth level in a raise, where it touched the quartz of the old foot-wall

[1] The Mexican geologists use the term 'schist' for this rock, but it is a misnomer.

[2] *Lozas* literally means flagstones, it is a term applied to the water-laid volcanic dust, porous in texture and well stratified, which looks like a sandstone. It lies on the top of the 'red conglomerate' and below the other tuffs. The *lozas* constitute a thinly bedded formation of green rocks, only from 10 to 40 ft. thick. At some places the texture is fine enough to make them equivalent to a 'freestone,' eminently suitable for building purposes. The façade of the Juarez theatre is built of this material, and the ornamental stone-work all over Guanajuato is derived from this source.

stopes. At the fifth level — 800 ft. (along the vein) below the Purisima adit and 1,320 ft. from the outcrop — cross-cuts and raises had proved that there was 120 ft. of pay-ore, which, allowing for the diagonal course of the cross-cut and the dip of the lode, was equivalent to a width of 65 ft. Another cross-cut, 300 ft. farther east, had proved a width of 45 ft. One section showed three ore-streaks, parallel in strike, but converging in dip toward the foot-wall.

In Fig. 4 I have drawn a generalized cross-section of the Veta Madre as it appeared to me in the Sirena mine. *A A* is the hanging wall and *C C* is the foot-wall, *B B* is the lower limit of the main vein and is called the

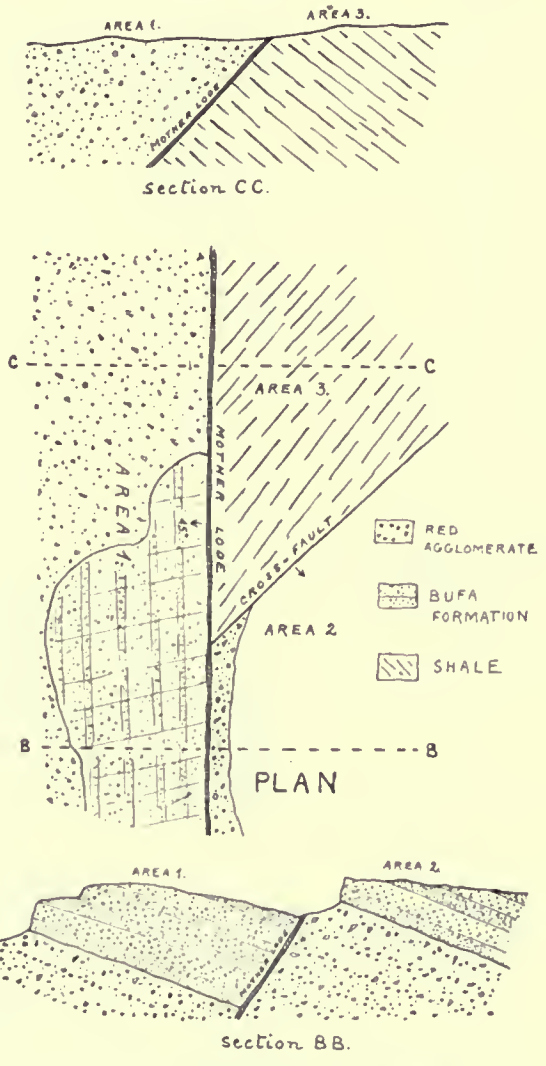


Fig. 3. Plan and Sections of the Veta Madre.

After R. H. Burrows.

intermedio, or intermediate wall. The distance between *A* and *B* is 25 to 75 ft., between *B* and *C*, 75 to 150 ft. On the foot-wall there is a vein, from 1 to 6 ft. wide, of quartz, which is not ore. The shale is bent near the foot-wall and is shattered between that line and the *intermedio*. *B B* represents the line of the fault, along which a width of shattered rock has created an ore-channel. Between *B* and *A* there are numerous stringers of quartz, some of which is ore, but the main orebody extends from the hanging into the agglomerate. The agglomerate does not wholly lose its identity by reason of impregnation with ore, and it is necessary to sample carefully in order to determine where profitable exploitation will cease. It is fair to say that the cyanide process has done more to widen pay-ore than the geologist, that is to say, the decrease in the cost of milling has enabled the manager to treat profitably material previously considered too poor. Where the lode is not rich the distinction between quartzified country and profitable ore is determined by the assayer, and not by the mineralogist.

I was informed that the orebody of the hanging wall, in the Sirena mine, was found while blasting for a cross-cut, intended to make room for a new hoist underground. The appearance of this ore suggests that it was formed by one of those movements that took place subsequent to the formation of the main fracture of the Veta Madre and its accompanying vein-matter; this latter movement evidently shattered the older quartz-filling and then proceeded through the hanging-wall country so as to make a big mass of brecciated ground, suitable for infiltration by mineral solutions, which re-cemented it with calcite and the more valuable metallic minerals. Diamond-drilling ought to be useful in exploring this ground; for the orebodies are large, but not connected. The old stairways and communicating passages appear often to be the bottom of underhand stopes,

Fig. 4.

and therefore suggest the lower limit of profitable ore at the time the work was done.

The geology of the Veta Madre has not received detailed study as yet, at least nothing has been published commensurate with the size of the subject, so that Humboldt's observations still possess a commanding interest. I shall quote from the old English translation already mentioned. He says: "The famous vein of Guanaxuato, which has alone, since the end of the sixteenth century, produced a mass of silver equal to fourteen hundred millions of francs,[3] crosses the southern slope of the Sierra de Santa Rosa." Beginning to touch upon geological matters, he states that "the most ancient rock known in the district is the clay slate (*thonschiefer*) which reposes on the granite rock of Zacatecas. It is of an ash-gray color and is frequently intersected by an infinity of small quartz veins. I consider this clay slate as a primitive formation, although the beds with very thin folia and which are surcharged with carbon, appear to approximate a transition clay slate. These beds (*hoja de libro*) are for the most part near the surface. On digging the great pit (*tiro general*) of Valenciana, they discovered banks of syenite or hornblende schist and true serpentine,

[3] £57,754,620 or, say, $285,500,000.

alternating with one another and forming subordinate beds in the clay slate."

Humboldt wrote in French, so that his use of the term *thonschiefer* indicates that he was thinking of the Erzgebirge, at that time—just one hundred years ago—the most scientific mining centre in Europe. His description of the shale, which constitutes the foot-wall of the Veta Madre, is right. It does exhibit a ramification of quartz veins. But the label 'primitive' will not do, for the formation is probably Cretaceous; moreover, 'primitive' is a word belonging to an outworn idea, that the basement rocks were the original cooled crust of the earth. Petrography knows no simple starting point; the rocks we see are only in a particular stage out of the many through which they pass in the course of their geological evolution. The modern geologist begins with the old crystallines, earlier than fossils. The undermost rock now known is a granitic batholith, which seems in places to have invaded the oldest schists. This granite may be an original igneous rock for aught we know, it is probably not a fused sediment, and is the nearest approach to anything 'primitive.' The crystalline granite, formed by slow cooling from a molten magma, when exposed to weathering at the surface of the earth, becomes disintegrated into sand and clay, which, being deposited in the ocean depths, are re-cemented and again solidified in process of time, passing through chemical and physical changes that make sandstone out of the sand, and shale out of the clay, at first, and then by further interplay of subterranean pressure, heat, and chemical action, these become on the one hand quartzite, on the other slate, with a mixed product of schist between them. The Valenciana shaft passes through the carbonaceous shale, with layers like the leaves of a book (*hoja de libro*) and penetrates the intrusive diorite, the decomposition of which, in places, gives the magnesian rock that Humboldt called 'serpentine.'

He continues: "Porphyry forms gigantic stony masses which appear at a distance under the strangest aspect, frequently like ruins of walls and bastions. In the country they go by the name of *bufa*. This porphyry, of which the Sierra de Santa Rosa is chiefly composed, is generally of a greenish color." Colors in rocks have ceased to have the importance they once had, for we have learned that the same rock can change its appearance while retaining an identity of composition. The name *bufa* still lingers at Guanajuato (but it is spelled with one f), and has almost replaced the higher sounding 'Sierra de Santa Rosa.' The sculptured summits and bold cliffs of La Bufa are due to unequal weathering of the rhyolite tuff that caps the Guanajuato series. Even in those days the term 'porphyry' played many parts.

Continuing, Von Humboldt mentions that "on the southern slope of the Sierra, the clay slate is covered with free-stone of very old formation. This free-stone (*urfels-conglomerat*) is a breccia of clayey cement, mixed with oxide of iron, in which are imbedded angulous fragments of quartz, lydian stone, syenite porphyry, and splintery hornstone." He speaks of the dip being opposed to that of the clay slate. Above this 'free-stone' there is "an agglomeration (*lozero*) of later date from which the finest hewn stone is manufactured."

The free-stone is a fine-grained tuff, used in the building of the city of Guanajuato, as already mentioned; it is soft enough to be easily worked, and yet hardens on weathering, so as to be durable. It is the *cantera* of the Mexicans. This formation occurs both above the shale of the foot-wall country, as Humboldt states, and also on the hanging-wall side; in fact, it marks the extent of the great fault of 1,200 ft., along which the Veta Madre was made. On the hanging-wall side the dip of the country is nearly at right angles to the vein, which cuts strongly across the bedding, and, for a long distance, follows a line along which the later tuffs and breccia are opposed to the shale. But on the outer edges of the mining district, the vein cuts through the younger rocks also. Humboldt saw this; he says: "The vein traverses both the clay-slate and porphyry. We have already stated that it has been wrought for a length of more than 12,000 metres; and yet the enormous mass of silver which it has supplied for the last hundred years, sufficient of itself to produce a change in the price of commodities in Europe,[4] has been extracted from that part of the vein alone contained between the pits of Esperanza and Santa Anita, an extent of less than 2,600 metres (8,529 ft.) In this part we find the mines of Valenciana, Cata, San Lorenzo, Animas, Mellado, Fraustros, Rayas, and Santa Anita, which at different periods have been very highly celebrated."

According to Humboldt, the European miners had been in doubt whether to consider the Veta Madre a "true vein" or a "metalliferous bed (*erzlager*)." He then proceeds to give some sound geological views:

"If we examine only the *veta madre* of Guanaxuato where the roof and the wall, in the mines of the Valenciana or Rayas, are of clay slate, we might be tempted to acquiesce in the latter opinion; for far from cutting or crossing the strata of the rock, the vein has exactly the same direction and the same inclination as its strata; but can a metalliferous bed which has been formed at the same period as the whole mass of the mountain in which it is found, pass from a superior to an inferior rock, from porphyry to clay-slate? If the *veta madre* was really a bed, we should not find angular fragments of its roof contained in its mass, as we generally observe on points where the roof is a slate charged with *carbone*, and the wall a talc slate. In a vein, the roof and the wall are deemed anterior to the formation of the crevice, and to the minerals which have successfully filled it; but a bed has undoubtedly pre-existed to the strata of the rock which compose its roof. Hence we may discover in a bed fragments of the wall, but never pieces detached from the roof."

The attempts to define a 'true vein' have not ceased even a hundred years after the above words were written; while the debate is adjourned and resumed at intervals by savants, the miner has disregarded such a nice point and has proved by his profitable toil that "metalliferous beds" are just about as good as the "true veins." The Calumet & Hecla, the Leadville orebodies, the Aspen contacts, the saddle reefs of Broken Hill, the lenticular masses of Rio Tinto, the disseminated copper deposits of Bingham and Ely—to mention only a few—are representative of occurrences that do not belong to what the schools of Saxony and Cornwall labeled 'true fissure veins.' Nevertheless, Von Humboldt's effort to distinguish between an ore deposit contemporaneous with the formation that encloses it, and one that has originated along later fractures crossing such rocks, is not without interest. He refers to the inclusion of rock fragments in in the *Veta Madre* in the following paragraph:

"Its extent varies like that of all the veins of Europe. When not ramified, it is generally from 12 to 15 metres in breadth; sometimes it is even strangled to the extent of half a metre; and it is for the most part found divided into three masses (*cuerpos*), separated either by banks of rock (*caballos*) or by parts of the gangue almost destitute of minerals. In the mine of Valenciana the Veta Madre has been found without ramification, and for a breadth of seven metres, from the surface of the ground to the

[4] An effect produced seventy years later, by the equally tremendous output from the Comstock lode, in Nevada.

depth of 170 metres. At this point it divides into three branches, and its extent, reckoning from the walls to the roof of the entire mass, is 50 and sometimes even 60 metres. Of these three branches of the vein, there is in general but one alone which is rich; and sometimes when all the three join and drag one another, as at Valenciana, near the pit of San Antonio, at a depth of 300 metres, the vein contains immense riches of an extent (*puissance*) of more than 25 metres. . * * * Valenciana is almost the sole example of a mine, which for forty years has never yielded less to its proprietors than from two to three million of francs (£82,506 to £123,759) of annual profit."

Here we have the Spanish equivalent of our term 'horse,' literally translated into *caballo;* it is the included rock that the vein rides, passing astride of it. If the branches of the vein do not re-unite, the result is a split or embranchment; if they come together, it is a 'horse.'

Dikes of andesite penetrate the agglomerate and the shale in various directions, and, as Mr. Robert T. Hill suggests, it is to them that we may impute the latest mineralization of the district; at least, it is probable that their intrusion along lines of fracture was coincident with a period of thermal activity. The Veta Madre, as a big width of rock sheeted by fractures near the contact of two unlike formations, afforded unusually favorable conditions for the penetration of ore-forming solutions, which followed the main fractures and spread outward and upward into the shattered agglomerate, where they found the inducement to precipitate the wealth of silver that is now suggested by the name of Guanajuato.

SPONTANEOUS IGNITION OF COAL.—Many coals containing a high percentage of pyrite are perfectly safe, and have never been known to heat seriously or ignite, while other classes of coal, practically free from pyrite, invariably suffer from spontaneous ignition under conditions favorable for its production. A careful study of the phenomena occurring during the heating of a mass of coal leads to the conviction that the pyrite present can only play a subsidiary part, and that it is in reality the absorption of oxygen by the freshly won coal, and the activity of the condensed gas in contact with the hydro-carbons of the coal that are the active factors in causing the ignition. In the seam the pores of the coal (for a trace of the original structure still remains in it) are filled with methane, or a mixture of methane and carbon dioxide, gases produced during the actions that led to the formation of the coal. When this coal is mined and brought to the surface, the coal exudes these gases from its surface, and in turn absorbs oxygen from the air. The action, however, cannot go on to any great depth in the coal, and while the pieces are fairly large no heat shows itself, but as the coal gets more and more broken by jolting during carriage and shooting into the ship's hold, the surface becomes enormously increased, and the mass of fine coal formed under the tip and below the hatchways in the ship is generally the spot at which heating and eventually ignition develops. The mere absorption of the oxygen, however, is insufficient to bring about serious consequences unless there be an initial rise in temperature to start the action, and in coal-cargo ships it is found in the enhanced air temperature in the tropics, in ship's bunkers by contact with the casings near the boilers, and in stores on shore by proximity to a steam-pipe or flue. In every case it was found that the spontaneous ignition of the coal started at the point where the cause of the initial rise of temperature was to be found.—Vivian B. Lewes, in *Iron & Coal Trades Review.*

Silver-Lead Smelting Practice.—III.

By T. S. AUSTIN.

Edited for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

*SMELTING OF OXIDIZED ORES AT CHIHUAHUA.—The plant consists of two 42 by 120 in. Fraser & Chalmers blast-furnaces, Root blowers, and a good Corliss engine; but the arrangements are poor and a number of minor defects appear. Some of these I can adjust, the others must go for the present, or until I have made enough successful running to warrant radical changes. The furnaces are good ones, and I want to make them run a large tonnage—as large as the endurance of the men will warrant. The ores are, first, a lead ore of Pb, 35%; SiO_2, 17%; Fe, 25%; and carrying 25 oz. Ag per ton; second, a low-grade dry ore of SiO_2, 35 to 50%; Fe, 10 to 15%; CaO, 10 to 25%; and containing 20 oz. Ag per ton. For fluxes we have a good limestone and an iron ore carrying a little silver. The proposition is a close one in some respects, and the profits must be sought in smelting the dry ore. I want to get a large tonnage through my furnaces. There will be some little matte, but not enough to keep a fore-hearth going, and I have overflow-pots that I expect to use. Of course in the old way I would put through 75 tons to the furnace, but I want to beat that record out of sight.

I am running two furnaces now quite well, but had a great deal of trouble at the start from non-reduction. This was due to the nature of the ore and to the low smelting-column. I started the furnace just as it was constructed, namely, with a thimble 3 ft. 6 in. below the floor-level, giving about 12 ft. 6 in. of smelting-column. I quickly pulled these out, and fed the charge against the sides of the furnace, but under the projecting charge-plates. The bad class of labor (with failure to feed properly to the sides) made this unsuccessful, and I then altered the furnace so as to have closed tops in the old-fashioned way. I lowered the hoods to within 18 in. from the floor, and bricked up to them, thus obtaining 16 ft. of a smelting-column. Thus I was able to get the furnaces under control, place the ore against the walls, and watch the feeders. Since the change I have got good reduction and good running. The ores are all coarse, and contain sulphates and arsenates, which make reduction difficult. I have no sulphides to lend their aid to reduction. I am now using about 18% coke on the charge, and, while I may get to 17 or even 16%, I do not expect to do better. The last figure I hope to reach only when I can get to bedding the ore, and obtain favorable slags for continuous runs. Just now I am from hand-to-mouth, and put on many a charge without analysis of some of its constituents—guessing, in fact. Of course our ore is pretty dry with an average of but two per cent of moisture, so the fuel percentage is not so bad considering. Probably with higher furnaces a lower consumption of fuel could be reached, but this is for later consideration, and I think that by January we shall get sulphides rich in silver. I am giving the preference to the whole-slag (1 to 1). Our ores are pretty pure here, so that the three constituents (SiO_2, FeO, and CaO) add up to 92%. This is no advantage, as I have to figure higher CaO and FeO in order to maintain the proper oxygen ratio. I figure the slag con-

*These observations of T. S. Austin, recently deceased, general superintendent of the Southern Department of the American Smelting & Refining Co., are compiled from letters written by him to his brother, from 1883 to 1906, covering most of the period of his wide experience in silver-lead smelting, and to some extent that in base-bullion refining. They lack some of his recent experiences, but show that much of his knowledge had been brought into finished form some time before his death. The notes refer largely to his work at Socorro, New Mexico, Monterey and Chihuahua, Mexico, and to El Paso, Texas, together with other technical observations made during that time. Professor L. S. Austin's remarks are in brackets. The previous articles of this series appeared in our issues of February 23 and March 16.

stituent at SiO_2, 35%; FeO, 28% and CaO 27%; and this gives me a slag of very acid characteristics. I would like to have more Al_2O_3, ZnO (if in oxide form), and MnO. The more the bases, the more fusible the slag, provided the RO bases are of a fusible nature. I am inclined to think that ordinary slags, resulting from varied mixtures, often contain the alkalies Na_2O, or K_2O, and are thus rendered more fusible. Ores containing porphyry, kaoline, etc., contain quite an amount of K_2O and Na_2O. However, I must work here until I can get a basis for future calculation.

Our main trouble now is the low grade of the dry ore, and also its scarcity, and unless we can change and improve this, we cannot keep going. I think, however, that we can get large quantities of the sulphides I mentioned, and, if so, the success of our plant is assured, as there is plenty of lead ore. Copper is a good removing agent, and so is plenty of lead—sulphides, however, are not so sure. I am doing pretty well, though, in this direction, for, with 9 to 10% lead on the charge, the slags run but 0.5 to 0.7% lead. I could improve this with 13% lead on the charge.

[In January, 1895, he writes:] I have been running the furnaces quite steadily and well, and now have matters in pretty good shape. Still I have plenty to do in detail, as I keep my smelting books in all branches, and this requires a certain amount of desk work daily.

I shall, when I get an opportunity, raise my furnace three or four feet, making them 20 feet above the tuyeres. I think the increased height acts more as a packing to make the furnace tight, and that low fuel is the result of having plenty of sulphides. I cannot believe that four feet more of charge, which the gases have to travel through, is capable of absorbing much, if any, more carbon monoxide from them, after the gases have reached this cooler zone of the furnace. In my case the increase of height would enable me to get the furnace tight, and confine the gases longer in the lower parts of the furnace, where the heat, and consequent reactions, are more intense. When the blast-pressure is raised, and other things (as speed) are unaltered, combustion (and with it reduction) are intensified at the point of admission of the blast. Of course, it is all very well to have the nerve to cut fuel, but, having had the nerve a number of times, and with very disastrous results, I keep to the quantity that experience has shown me to be safe, and, even then, "run on the ragged edge." With my practice (oxidized ore altogether) I do not have much variation from that of the early days.

In the absence of much RO bases I have to use more lime, and, in the whole-slag I am running, often get up to 31 to 32% CaO. My ordinary slag contains SiO_2, 35%; FeO, 27%, and CaO, 31%. It has every appearance of the acid whole-slag and in the pots, after cooling, the crystals show acicular forms, in fact I have not seen anything approaching a cubic crystal since I have been here, and would not know how to go to work to make them.

My experience in feeding is, that to get good results, one must charge the fine ore against the sides. Any device that would bring this about in an automatic feed would, it strikes me, be the most desirable. On the other hand, the very high shaft may obviate the necessity of this careful hand-feeding, simply from the extra high column of charges. I know that once you get to a certain height a couple of feet more will 'tighten up' a furnace wonderfully. My slags are of late too high in silver, due I think, to want of tightness in the furnaces. Formerly all my lime-rock came very fine and I could get the furnaces tight with it, but now I have to use broken rock.

[In May, he says:] I have just finished raising my furnace to 20 ft. over the tuyeres, and have just got one blower in and running, and I find I shall effect a coke saving. My main trouble is a tendency to over-tightness and packing, which will require watching. However, I think I shall soon get this correlated with the fuel, and effect a notable improvement in every way.

[By June he was running the furnace with good success and with some saving in fuel. He adds:] I find that three inches of mercury is sufficient blast-pressure when carrying the furnace full. My ore is, however, quite lumpy, and if it were not so, I would never have made this furnace so high. I am using but 8 to 10% lead on the charge and am carrying 15% coke.

SMELTING IN MEXICO is as cheap as it is in the States. This is natural, because the smelting talent and experience of the States has been transplanted there, and has at once inaugurated the best American practice. Competition on all ores is very close. This does not effect us very much as we handle our own ore and the low-grade is rather too low-grade to ship. Then we are well situated to load cheaply, to unload automatically, and to smelt with a small amount of labor and expense. With our compact plant and few officers, we work very cheaply in this respect. Our total labor and salary expense per ton of material is but 85 *centavos*, or 45 cents gold.

I am rather peculiarly situated. My furnaces are not connected to dust-chambers or flues, consequently the smoke and dust go off by the furnace-top. However, the ore is pretty lumpy, and I have a 20-ft. smelting column, so that, at times, the smoke is almost imperceptible, and dust is trifling. These furnaces are designed so as to make the just-named conditions incumbent on me, and I would not sacrifice feeding-height by carrying the charge much below the feed-floor level. I do not have to consider the roasting of the ore, and I suppose, never shall.

I only use two No. 6 Root blowers running at 110 rev. per minute for two furnaces, and get a pressure of from two to three inches of mercury—generally an average of two. With this I smelt nearly 100 tons of material per day per furnace, and this rate of running is about as much as my men can stand.

THE NEW CLASSIFIER designed by Robert H. Richards, has the following list of points in its design: A sloping bottom in a V-shaped tank, which gives the water current a gradually diminishing velocity. A grating along this sloping bottom is divided into sections, the earlier of which have a stronger rising current coming up through the holes, the later in the series, weaker. This handles the grains of ore systematically. If the grain has weight enough, it drops in the first hole, if not, it is jumped up and propelled forward, and when it drops again, it tries at another hole until it reaches the place where its weight is sufficient for it to settle into the hutch below. In addition to this sloping grating there is a larger tube beneath, which serves all of the holes. In the grating belonging to its section above, this tube has a sectional area equal to the sum of the holes in the grating above, so that the current of water rising in it has exactly the same velocity as that in them. It follows from this that any fine grains of sand that accidentally find their way down through the grating have a second chance to be treated in the tube below and to be lifted out and up to take their proper place, if they settle too soon. As a still further means of making for good classification, a vortex current is used along the lower end of this large tube so that the rising current on all sides of it are even. This is to prevent the descending currents that so often hurt classification.

A System of Ore-Bedding.

By the courtesy of E. H. Messiter, of the Robins Conveying Belt Co., we are enabled to publish the accompanying illustrations of a system for bedding ore, as applied in the smelter of the Greene Cananea Co. at Cananea, in Sonora, Mexico. The system has been highly successful, and therefore a few notes will be welcomed by metallurgists.

Fig. 1. Steel Bins and Shaking-Feeder Car, With Conveyor Underneath.

Fig. 1 shows a part of the system of steel bins into which the 25-ton cars from the mine are dumped. Different lots of ore are placed in separate bins. In the centre of the picture is the large self-propelled motor-driven shaking-feeder car, which serves to empty these bins one at a time, and to deliver their contents to the 30-in. conveyor, which runs along the ground under it. This conveyor, after leaving the bins, rises at an inclination of 20° to a point from which it discharges either to a gyratory crusher or directly to the next conveyor, which leads to the sampling mill. A sample is taken from each lot on its way to the beds. The ore then is carried to one of three conveyors, placed in over-head structures like the one in the centre of Fig. 2. These conveyors are equipped with a new type of fast-moving ore-bedding tripper, by the action of which the ore is uniformly distributed throughout the length of the piles, which is 400 ft.

Fig. 2. Beds of Ore. Conveyors in Overhead Structures. Reclaiming Machine at Work.

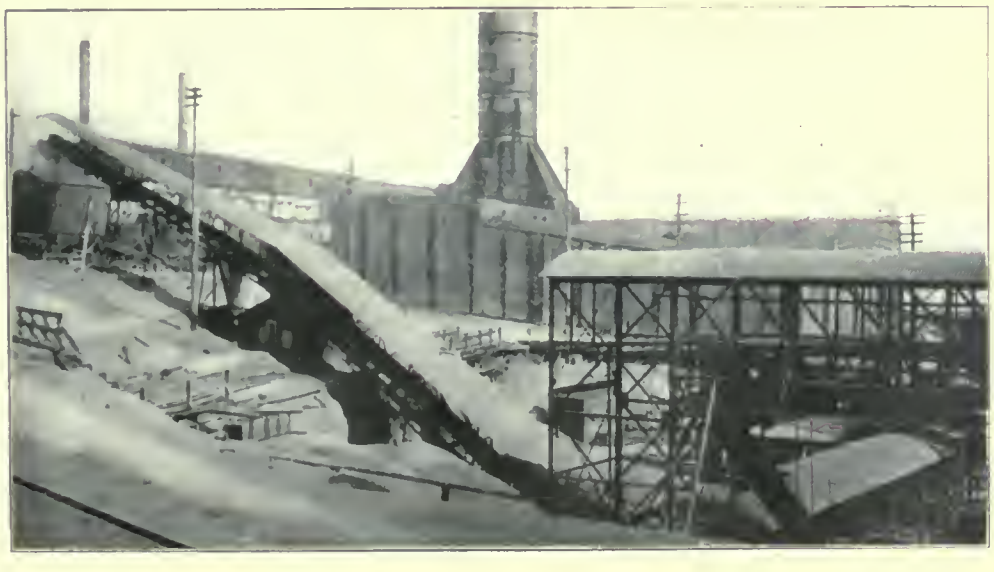


Fig. 3. Ore Conveyors, Delivering Mixture Direct to Furnaces.

A complete bed is seen to the left of Fig. 2.

The same photograph shows the reclaiming machine in action, having removed a little more than half of the bed. This machine attacks all parts of the cross-section of the bed in a perfectly continuous and uniform manner. As a result of the longitudinal uniformity produced by the ore-bedding tripper, and the uniformity with which the reclaiming machine excavates transversely,

there results a mixture that is remarkable in its regularity. At the time these photographs were taken, the machine was delivering a complete smelting mixture to the furnace. The machine travels ahead automatically at any desired rate, so that no attention is required in this operation other than that necessary for lubrication, and for the starting and stopping of the machinery.

Fig. 3 shows the end of the bedding-conveyor structures and the long inclined conveyor that carries the mixed charge up to the furnace-house, and also the horizontal conveyor for distributing to the several furnaces. The horizontal conveyor over the furnace-house is capable of delivering either to bins from which barrows may be filled by gravity with a complete charge, or of delivering the mixture directly to the furnaces without any wheeling whatever. The last procedure is clearly destined to be the regular method of operation.

Considering the storage system by itself, it is an interesting fact that this can be built at a lower cost than bins of the same capacity. This includes the cost of the reclaiming machine. When the extremely low cost of storing and reclaiming is taken into consideration, it seems that this system should be capable of wide application, now that its feasibility has been demonstrated by actual working. In fact, the bedding and mixing do not actually cost anything. There is probably no way in which the material can be stored and reclaimed at less expense, whether bedded or not.

Dedication of the Engineering Societies Building.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES S. PALMER.

Long before the readers of the MINING AND SCIENTIFIC PRESS may chance to light on this column they will have read in their local newspapers all about the formal christening of the really princely home given by Mr. Andrew Carnegie to the United Engineering Society as holder for the great national societies of mining, mechanical, and electrical engineering. And as good members of our own American Institute of Mining Engineers, we cannot avoid some quotum of interest in the change of the old headquarters from John street up to Thirty-ninth street.

The special dispatches in the newspapers have noted the program of the occasion, from the heavy and somewhat ambitious addresses to the technical papers, and modulating gracefully into the smoker and vaudeville of Friday evening. Each part in its way and place gave dignity or recreation to the interested visitors in appropriate way and degree; but an informal account of the exercises of Tuesday afternoon may perhaps serve to bring color and warmth to something that the daily press is only too apt to chronicle in a manner rather mechanical and perfunctory.

In the first place, the music rendered by a double string sextette, was distinctly select. "Such harmony is in immortal souls." This gave an elevated tone to the program of Tuesday afternoon. In the next place, one or two timely blunders gave a charming naturalness to what might easily have degenerated into a too formal affair. The maul used by Mrs. Carnegie in laying the corner-stone of the building was to have been used as the gavel for the dedication; but it so happened that it reclined behind an obstinate safe-lock which could not be coaxed to yield it, even for a loan. Mr. T. C. Martin, the president of the Engineers Club, read a telegram from Mr. John Hays Hammond, telling of his regret in being detained unavoidably, while all the while Mr. Hammond was on the platform and within arm's reach of the speaker. But these trivial incidents were a relief.

The opening prayer was delivered by the venerable apostle of sweetness and light, Edward Everett Hale, whose son was of the firm of architects that won the contract for the erection of the building on plain merit. Perhaps it was the consciousness of this fact that helped the grand old man to voice as simple and noble a petition as Providence ever heard from an association of technical scientists.

But Mr. Carnegie was easily the chief character on the stage. Here is a man who has all the temptation, and much of the opportunity, to 'slop over.' He might easily have betrayed an unpleasant, though pardonable, self-consciousness; a conceit, a pride, a patronizing assumption of superiority. But this man of diminutive physique, but of colossal generosity, this fairy-land benefactor, who is enjoying the fun of unparalleled giving, was as natural and as simple as a boy. He was at his best as he said: "When you see men uniting for the common good, there is union—solidarity; but when men unite against the common good—they can't trust each other"—and with a quick, disruptive gesture, Mr. Carnegie had the audience electrified. His graceful allusion to Mrs. Carnegie as a helpful planner with him was almost implied, rather than formally stated, but it was there; and it was felt. Mr. Carnegie's enthusiasm over the beautiful and practical results of the architects was as spontaneous as it was irrepressible; for it fitted in with the obvious promise of increased usefulness of the engineers to the world at large.

Charles W. Hunt made the impression of a tactful and forceful presiding officer, with suitable remarks for introducing each speaker in turn, and he was especially happy in introducing President Hadley of Yale as one whose training and vision gave him the advantage of looking through the present to the future. This educational executive, nervously full of expectant enthusiasm for his theme of technical worth and merit, combined with full observance for ethical standards of genuiness and helpfulness, gave another setting to the almost dramatic contrasts of the program. And it was well to listen to the dictum of academic teaching; but, as we left the hall, we could not escape the thought that after all, the foundation of it all ought to be, is, was, and will be, the serious work of the engineer. The engineer cannot always talk—sometimes he can hardly write; but he can plan great service, and he can translate it into accomplished fact.

The next time you and I are in New York City, let us remember that we have a new and an almost palatial technical home for study and research on Thirty-ninth street. It is close to the new home of the Engineers Club, only one block from the new City Library, and to the traveler by railway is as accessible from the Grand Central depot, or the *Times* square, as was the old place on John street. And the Santa Claus face of the giver has more reason than ever to add another genial smile to his countenance as he contemplates this new agent of concentrated helpfulness.

THE Heilungchiang gold mines, which ever since the Boxer trouble have been in the hands of the Russians, are to be handed back at cost to China. In this connection a Chinese Taotai, who has been appointed superintendent of the mines in question, accompanied by eight interpreters, and assistants, 20 miners from the Kaiping colliery, and a regiment of armed troops, has left Tientsin to take over the property. The party also took along 2,000 extra Mauser rifles, with sufficient ammunition to arm two other regiments, to protect the miners from lawless raids of Russian outlaws and Chinese mounted bandits. The mines are said to be exceptionally rich in the precious metal.

Feeder for a Tube-Mill.

Written for the MINING AND SCIENTIFIC PRESS
By N. C. GROCH AND F. J. NAGEL.

In a 16 by 4-ft. trunnion tube-mill having a packing gland on the feed end, it was found that the wear at this point was excessive, and after the feed-pipe had become slightly worn, it was necessary to shut down frequently to renew the packing.

To remedy this a small spiral pump (*A*) of the Frenier type, made of ⅛-in. sheet iron, was fastened to the mill in the following manner: A disc (*E*) of ½-in. iron, having a two-inch round hole in the centre, was bolted to the four stud bolts that formerly held the packing ring, to this disc was bolted one-half of a two-inch flange-union (*C*) into which was screwed a two-inch pipe (*D*) of such length that the body of the pump cleared the base that formerly supported the feed-pipe casting; to the end of this pipe was screwed another one-half of a two-inch flange-union (*C'*), which was securely bolted to the spiral pump.

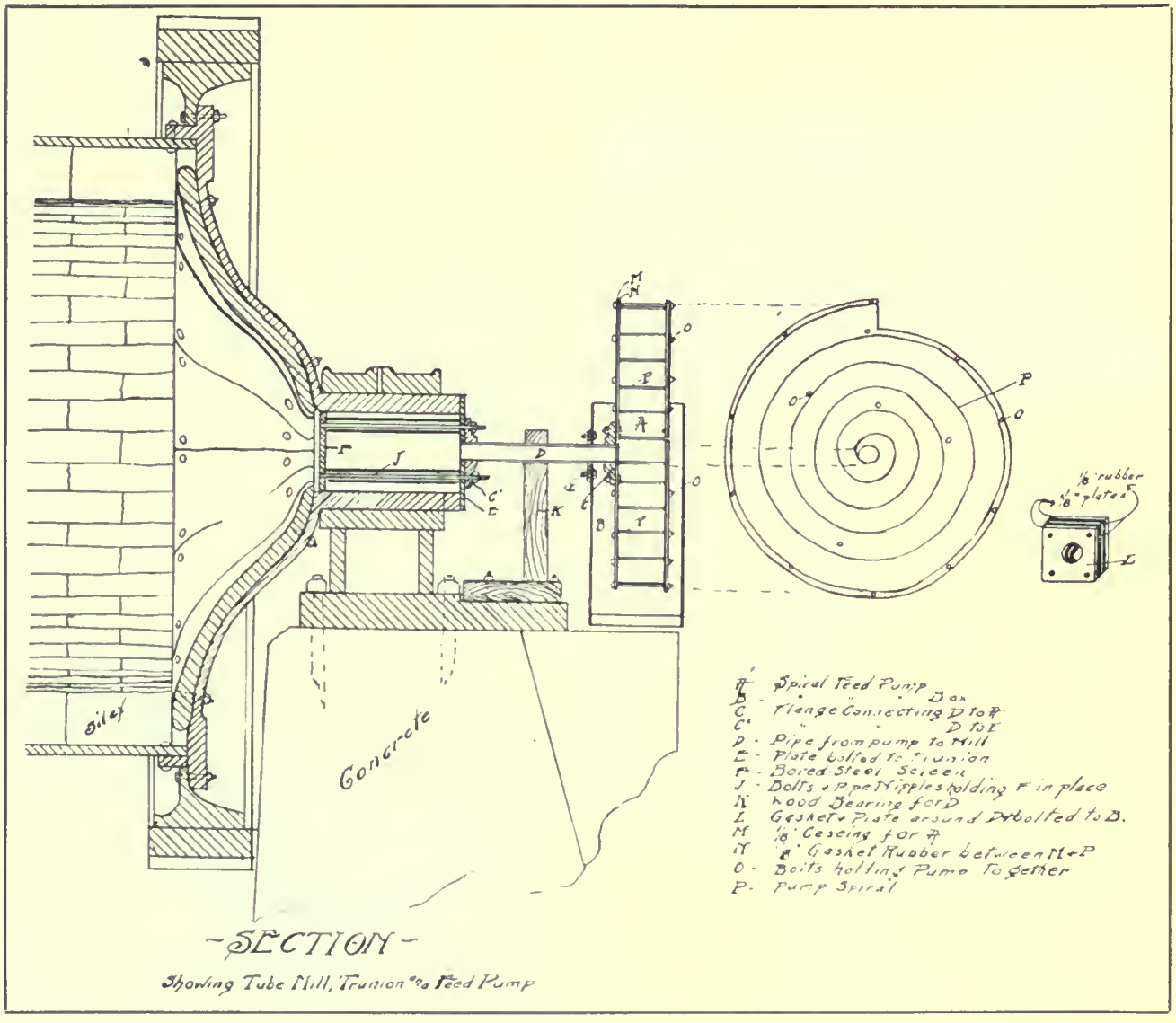
Gaskets of rubber packing were used in all places where leakage was likely to occur. As the pump was on the end of the pipe, a wooden bearing (*K*) was put between the pump and the tube-mill in order that the pump should not sag. The threads in the pipe have to be opposite in direction to the rotation of the tube-mill in order that the pump shall not be loosened by the friction of the sand in the box, in this case right-hand threads were used with a left-hand mill.

The pump rotated in a box into which the coarse pulp from the classifier was fed, the intake of the pump, scooping through this box, picked up the pulp and forced it into the mill, and worked equally well on water or thick pulp. As the pump picks up the pulp from rest, it is not essential that the cone or classifier be placed at the head of the mill; any place from which the pulp will flow to the box is sufficient.

As the pump is bolted rigidly to the mill, it will make the same number of revolutions; in this case 27 to 29 was found to offer no difficulties. The speed being fixed, and the diameter of the pump probably dependent on local conditions, the capacity will depend on the number of coils in the spiral and the width of the pump.

With the packing gland it was impossible to fill the mill more than half-full of pebbles, because the pebbles entered the trunnion, blocked the passage, and the pulp backed up; with the pump and a small perforated steel grating it was possible to fill the mill to any desired point.

While the principle involved, that is, a vertical spiral, is not new in tube-mill design, we do not know of any other feed equally satisfactory in its operation that has the following advantages: Adaptability to nearly all trunnion tube-mills; simplicity of construction; ease of inspection, and absence of wearing parts. All of which we think this device possesses.


A - Spiral Feed Pump
B - " Box
C, C' - Flange Connecting D to P
D - Pipe from pump to Mill
E - Plate bolted to Trunion
F - Bored Steel Screen
J - Bolts & Pipe Nipples holding F in place
K - Wood Bearing for D
L - Gasket & Plate around D bolted to B.
M - ⅛" Ceseing for A
N - ⅛" Gasket Rubber between M & P
O - Bolts holding Pump Together
P - Pump Spiral
Concrete
-SECTION-
Showing Tube Mill, Trunion & Feed Pump

Feeder for a Tube-mill.

The Gold of the Snake River.

Contributed to the MINING AND SCIENTIFIC PRESS
By ROBERT N. BELL.

*In the past, the north shore of the Snake river, which forms the southern boundaries of Lincoln county, has given this division of the State of Idaho some standing in the production of gold, as that portion of the river was the scene several years ago of a successful gold-dredging enterprise, based upon the treatment of the extensive beds of gravel carrying the fine scales of gold, for which this stream is noted.

This was the operation of the Sweetzer-Burrows Dredging Co. of Minidoka, whose plant and its operation was described in detail in the report for 1904. The plant consisted of a suction dredge that ran several years and handled 3,000 cu. yd. per day, saving 90% of the gold content of the gravel raised from the low bars in the stream and along its borders between high and low water, where the gold concentrates at the short bends of the stream.

Ground-Sluicing on the Snake River, Idaho.

The company's operations commenced thirteen years ago, when it practically had the choice of the stream, and the results obtained, skimming the best layers of gravel to a depth of about six feet, averaged less than ten cents per cubic yard. After several years' continuous operation, which resulted in one $10,000 dividend, the enterprise was abandoned, because the margin of profit was too small. There has been probably $1,000,000 worth of dredging plants built along the Snake, but this is the only one that ever paid a dividend.

The counties of southern Idaho that border the Snake river report annually at the United States Assay Office at Boise the small shipments of gold derived from sluicing operations along the low bars, which border the stream for miles. These small operators are satisfied with two to four dollars per day per man, during the summer. They pick a favorable place along the first terraces, which rise 10 to 20 ft. above high-water mark, and afford a little dump, then build what is locally called a 'machine,' consisting of about 40 ft. of 3 to 4-ft. sluice, floored with a steel-punched screen in the first box. A sluice-head of water, generally derived from some of the big irrigating canals, is diverted to the ground and sluicing commenced through the flume. The first three to six feet below the soil generally carries the best pay. The fine material drops through the screen and is diverted at right angles on both sides of the sluice through a distributing box on to a series of inclined tables 4 ft. wide and 10 ft. long, covered with canvas or burlap, on to which the fine material is fed with plenty of water, and the gold and concentrate readily settle. About 90% of the gold and the heavy concentrate are caught on the first four feet of the tables; this is swept into a tray every few hours by diverting the pulp and turning on clear water. The concentrate and gold are stored until a sufficient amount has accumulated, to be run through a small *arrastre*, or grinding pan, in which quicksilver is added. The gold amalgamates perfectly after a few hours' grinding. This simple method, intelligently handled, will save 90% of the visible fine gold of the Snake river gravel. It is applicable, also, to big dredging operations and has never been improved upon by any patented process in practical use in this field.

Personally, I am sceptical about the invisible gold content of these gravel deposits, except the coated gold, which is readily recognized. The Snake river gold is finer than any natural placer gold I have seen. It is high-grade and worth $19.50 per ounce, but requires fully 1,500 colors to weigh one cent in value, yet under a powerful microscope, each color is an individual nugget showing abrasion. These particles are often coated, touched, or spotted with a crystalline white film of some foreign substance that looks like silica under the glass, and this is what makes it necessary to polish it in a grinding pan before it will amalgamate freely. The size of the particles range within comparatively narrow limits, but there is no gradual shading from the smaller colors into impalpable dust, and if the gravel contains any invisible gold that can not be recognized in an ordinary pan with the naked eye, it must be locked up in the particles of heavy concentrate.

The recent experiments of Dr. David T. Day of the United States Geological Survey at Portland, Oregon, on the heavy placer concentrates of the Pacific slope, to determine their value in other metals and minerals besides gold, including a number of samples of Snake river concentrate, which almost invariably yielded from a trace to quite an appreciable amount of platinum, but I doubt if many of the results obtained were from representative samples; and while the subject is an interesting one and well worthy of close and intelligent investigation, in the present state of the platinum market, I am afraid the particles of platinum are too thinly scattered along this stream. The actual contents of magnetite and

Sweester-Burroughs 10-in. Suction-Dredge; 3,000 cu. yd. Daily Capacity, on the Snake River, Idaho.

*This matter appears also in the Eighth Annual Report of the Mining Industry of Idaho. Illustrations donated by Mr. Bell.

similar heavy residues in these gravel beds, as nearly as I can figure, is from 0.5 to 0.75% of the gravel, and when their visible free and white coated gold content is properly amalgamated, the residue will not assay over five dollars per ton in gold.

I visited the point on Snake river from which the highest result in platinum was reported during the progress of the Portland Fair, which yielded platinum at the rate of 0.18 oz. per ton and several hundred dollars gold per ton, from the same sample, and learned that it was selected from the first burlap on one of the tables, with the fine gold left in, and probably represented a concentration of several thousand to one. A subsequent sample of clean black concentrate taken from below the grinding pan, after the free gold had been amalgamated, was sent to Dr. Day and gave a result of $3 gold per ton and only a trace of platinum.

The statements of irresponsible promoters that the Snake river gravel beds run from 25 cents to a dollar or over per cubic yard in gold are usually gross exaggerations; for while such material does exist along this stream,

Burlap Gold-Saving Apparatus at the Welsh Diggings, Near Blackfoot, Idaho.

it occurs usually in thin layers an inch or two thick, with a foot or two of comparatively barren gravel between the layers, and I doubt whether there exists a bed of gravel anywhere on Snake river that will average over 25 cents per cubic yard where a depth of ten feet is worked. There are some favorable areas where 10 to 15c. per cu. yd. can be obtained. The gravel is usually well worn and small and affords ideal conditions for dredging, with the exception of occasional layers of *caliche*, a semi-cement that dissolves readily when water soaks it a while. With a large enough plant and intelligent handling, these may be made to pay, but the possible margin of profit, working for the gold content alone, would be small and unattractive, unless there be gold or platinum, not apparent to the eye and to ordinary methods of saving, that can be recovered.

That platinum exists in metallic form, associated with the gold in these gravel beds, is not questioned, for while it can rarely be seen in panning, it invariably shows in cleaning amalgam. In the operation of the Sweetzer-Borrows dredge near Minidoka, it was always observed at clean-up time in gray metallic particles floating on the 'quick' when the hard amalgam was thinned for the purpose of separating foreign matter from the gold. A quarter of an ounce of clean platinum recovered in this manner is now in the possession of Lewis Sweetzer of Rupert, Idaho, one of the owners of the enterprise referred to. It is perfectly clean gray metal in scaly particles about as small as the fine gold.

I have gone into this detail for the purpose of putting intending investors in Snake river enterprises on their guard against exaggerated statements. People are often led into enterprises of this kind on the unwarranted promise of great profits; they lose their money and are ever after sore against the State. While it is possible that moderate profits may be made from the proper handling of these deposits, they are generally low-grade and exaggerated statements of their values should be liberally discounted.

ETHER.—The following daring conception of the ether was practically the last product of the brain of the great Russsan chemist Mendeleeff: Starting with the assumption that the ether possesses both mass and materiality, and by extrapolation inserting a zero group in the Periodic System, and a zero series of elements lighter than hydrogen, he deduced that in this series one element should have an atomic weight many times less than that of hydrogen, that is, less than 10^{-6} if H=1; it should have a monatomic molecule like argon and helium, and its exceedingly small density, or, in other words, the exceedingly rapid motion of its molecules, should enable it to permeate and penetrate all matter and space. This gaseous element he believed to be the ether, and he was satisfied that the recently discovered physico-chemical phenomena connected with radioactivity could be satisfactorily explained by assuming the emission of a portion of this ether and the entrance of new ether into the sphere of attraction of particles of normal mean velocity, if it were supposed that uranium and thorium, having the highest atomic weights among the elements, would have in the highest degree that power of attraction which lies between gravity and chemical affinity, and which would cause the accumulation of ether atoms round their molecules. This daring conception of the ether was practically the last product of the brain of the great chemist, and as such is now invested with a peculiar interest for those who are left to lament his loss.—*Chemical News.*

ZEOLITE is a term applied to those minerals that fuse readily with intumescence before the blowpipe. The more important of the zeolites are analcite, chabazite, harmonite, stilbite, henandite, natrolite, and thomsonite. They are related to the feldspars in constitution. They constitute a collection of finely crystallized minerals, and as such are valuable as specimens for mineral cabinets.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Specimen from Garden Valley, marked J. E. L., not received.

From Caliente, Cal., specimen marked C. F. B., has not arrived.

C. T. D., of Searchlight, Nev., sends a specimen of granular black Tourmaline.

The specimen sent by S. B., of Victor, Colo., is a mixture of Quartz, Garnet, and Magnetite. Of no value.

The silicious powder, Tripolite, from Cripple Creek, Colo., marked R. H. T., has but little market value at present.

A. F. D., of Penticton, B. C., sends Feldspathic sand. It is of no value for making cement, but should make concrete.

Replying to J. A. McD., of Olalla, Canada. 'Garnitite' is not a recognized name of either a mineral or rock. Biotite granite is called granitite.

The samples from Ibapah, Utah, marked J. S. L., are: No. 1, Topaz; No. 2, Hematite; No. 3, Hematite; No. 4, Cherty rock, containing brown Mica and the green Copper silicate.

The specimens from Wonder, Nev., marked W., are: No. 9, Biotite Andesite; No. 10, compact Chlorite mass; No. 11, Rhyolite; No. 12, purple Fluorite, color due to Manganese; No. 13, contains the black oxide of manganese, Pyrolusite; No. 14, Manganese oxide; No. 15, Rhyolite; No. 16, rock stained with Manganese oxide; No. 17, Shale; No. 18, Quartz stained by the oxides of Iron and Manganese; No. 19, Biotite Granite.

The rocks from Coon Gulch, New Mex., marked H. A., do not admit of specific classification, owing to their metamorphosed and mineralized character. No. 1, serpentinized Metamorphic with Pyrite; No. 2, silicious Metamorphic; No. 3, altered Rhyolite; No. 4, chloritized rock; No. 5, Breccia; No. 6, 7, and 8, altered Volcanics; No. 9, Obsidian; No. 10 and 11, Metamorphic with cubes of Pyrite.

PRECIPITATION OF GOLD.—In the electrolytic precipitation of gold it is customary to use lead foil strips for cathodes, and iron sheets as anodes. The voltage between terminals is usually from two to three volts, and the best current density is found to be about 0.5 amperes per square metre. The gold is then deposited on the cathode in an adherent layer, and the lead cathode can be melted down. In the course of time fouling of the solution takes place by the formation of prussian blue and iron oxide at the anode. The substitution of lead, coated with lead peroxide, for the iron anodes has proved a failure, because of the formation of lead cyanide. Experiments show that at the start of electrolysis, very little gold is deposited during the first hours. This is due to the condition of the electrodes. Later the efficiency reaches a maximum, but any interruption of deposition causes a decrease in the rate of deposit. The efficiency of deposition is by far the greater, and the deposit firmest with a low current density. The efficiency varies from a fraction of one per cent to over seven per cent.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A grant of the right to mine and remove coal and to exercise the ordinary privileges of ventilation and drainage on the land of the grantor, with the right to transport other coal through underground entries, in the coal before granted, with the right of way for an inclined railway, and the right to use one acre of ground at the mouth of the pit and land for siding and switches along a certain railroad, was held not to give the right to sink a ventilating shaft in the land of the grantor, to ventilate mines under adjoining lands.

Cubbage *v.* Pittsburg Coal Co. (Pa.), 65 Atl. 797 (Jan., '07.)

A land-owner may drill an oil-well at any place on his own land, though this may draw from an oil-well on adjoining lands. The only remedy of the adjoining land-owner is to drill a well on his own land. But where the same person holds oil-leases of two adjoining farms he will not be permitted to combine with one land-owner to drain the oil from the well on his land to the detriment of the other land-owner.

Barnard *v.* Monongahela Nat. Gas Co. (Pa.), 65 Atl. 801 (Jan., '07).

A lessee of an oil and gas lease has the right of removal for a reasonable time only after he ceases operation, and after such time he cannot remove drive-pipe and casing that have become a part of the realty, and which cannot be removed without destruction to the wells and injury to the real estate.

Perry *v.* Acme Oil Co. (Ind.), 80 N. E. 174 (Feb., '07).

Pending the determination of a controverted mining claim, it was agreed between the parties that the adverse should be dismissed, and that, after the original applicant procured a patent to the claim, it could be conveyed to the contestant and others on demand and payment of a certain stipulated amount. It was held that the contract did not create a trust nor vest in the contestant any equitable title or interest in the property, but created merely the relation of prospective vendor and purchaser under an option contract.

Stevens *v.* McChrystal, 150 Fed. 85 (Nov., '06).

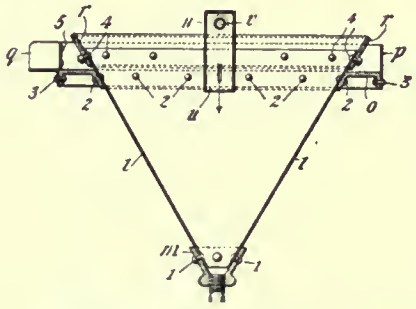
SILVER MINING IN CHINA.—Some years ago, says the *South China Morning Post*, a Chinese syndicate, with more capital than brains, started to exploit the Sam Cha silver mine in Kwai-Shen, which is about 300 miles from Wuchow. As no European mining expert was allowed to be employed, the enterprise turned out a failure. After an interval, a second syndicate was formed, but, owing to the same restrictions, it failed also. Over $1,000,000 is said to have been sunk in the venture, yet the mine is believed to be one of the richest in the world. Now the Taotai, at the request of the shareholders, has petitioned Peking to allow the services of a foreign expert to be retained, and this has been granted. A third syndicate has, therefore, been formed, and a contract entered into with a well-known Eastern banking company to advance money to obtain the necessary plant.

THE essential difference among the three processes for the lime roasting of galena is as follows: In the Huntington-Heberlein the ore is first partially roasted; that is to say, it is burned down to a content of 10 to 11% sulphur, and is then charged into the converter; in the Savelsberg process the ore mixed with the proper proportion of limestone and quartzose material is charged directly into the converter, there being no preliminary roasting; in the Carmichael-Bradford process the ore is mixed with a proportion of gypsum, and is then charged directly into the converter.

MINING AND METALLURGICAL PATENTS.

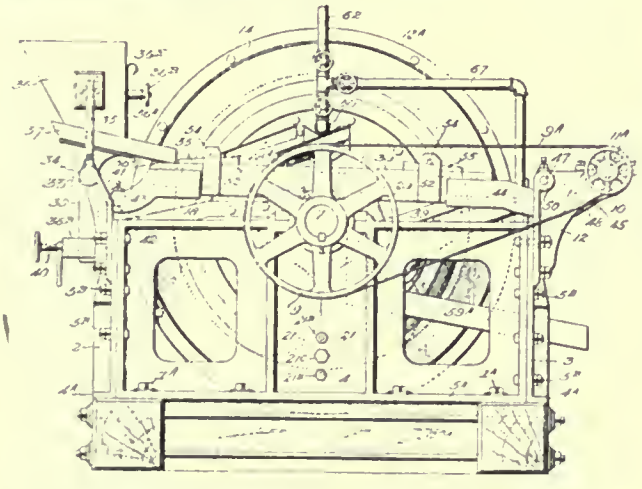
Specially reported for the MINING AND SCIENTIFIC PRESS.

CLASSIFIER.—No. 849,153; Charles W. Merrill, Lead, South Dakota.



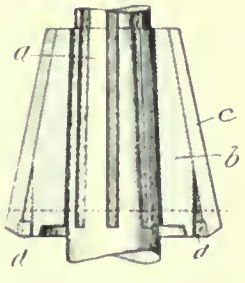
A static classifier consisting of a receiver having a main body of metal and a feed wholly within the periphery, and said periphery provided with an overflow-line composed of a thin strip of wood with the grain approximately horizontal.

ORE CRUSHING AND SCREENING MILL.—No. 849,037; Joseph Algert, Denver, Colorado.



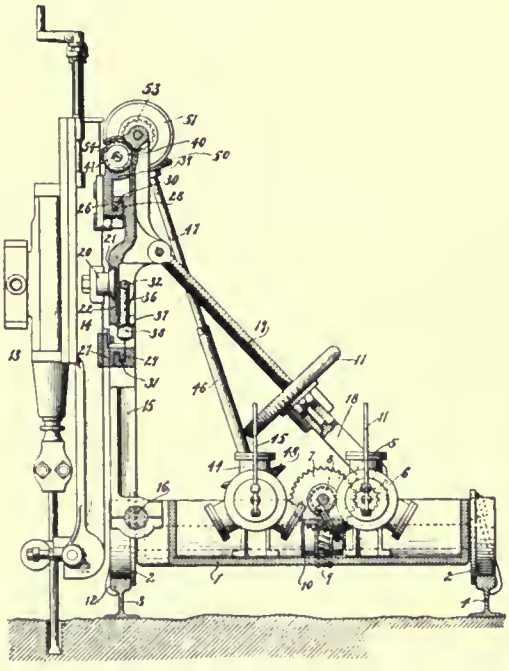
In an ore crushing and screening mill, a rotatable head having a flange on one side and a hub on the other side, a removable flanged-shaped ring attached to its opposite side having an introverted hooked-shaped inner peripheral edge, a divided circumferential ring having a recess-face fitting around said curved hooked end of said flange-ring, a shaft extending through the hub of said flanged portion, and means for supporting said divided flanges, and said divided circumferential ringing in a rotatably substantially water-tight joint on said hooked inner peripheral edge of said flange-ring.

ROCK AND ORE CRUSHER.—No. 848,782; George H. Thurston, Johannesburg, Transvaal, assignor to Allis-Chalmers Company, Milwaukee, Wis., a Corporation of New Jersey.



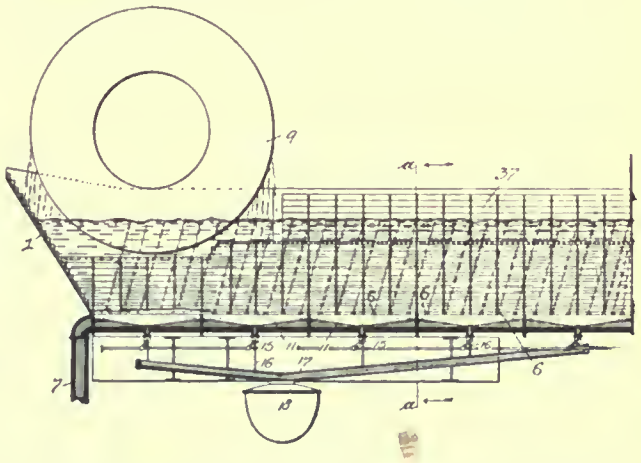
In a rock and ore breaker, a crushing-head comprising a core portion of relatively soft metal, said core portion having an inclined outer surface, a mantle of relatively hard metal closely fitting the core portion, and an inwardly projecting lug having an inclined face, said lug being located at the lower edge of the mantle, and said core being provided adjacent its lower edge with a vertical groove having inclined wedge portions for engaging the lug on the mantle.

CHANNELING-MACHINE.—No. 849,019; William Prellwitz, Phillipsburg, N. J., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey.



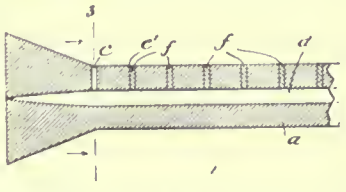
A channeler comprising a wheeled truck, a drill pivoted thereon, means for moving the truck to cause the drill to cut a channel to a predetermined point, and a motor connected to the drill for swinging it in the arc of a circle to cause the drill to complete the channel from said predetermined point.

GOLD-SAVING APPARATUS.— No. 849,101; Erastus S. Bennett, New York, New York.



An amalgamating-tank comprising upwardly flaring sides, mercury-containing pockets on the flaring sides, a bottom, a water-distributing conduit extending along said bottom, and having upwardly directed jet-nozzles, a plurality of depressions arranged at different points longitudinally of the tank-bottom, and each containing a body of mercury.

ROCK-DRILL.—No. 849,229; Frederick E. Glaze, Victor, Colo., assignor to The Eureka Drill Steel Company, Cripple Creek, Colo., a Corporation of Colorado.



A drill constructed with grooves and ribs, and a series of transversely disposed obstructions in the grooves, the obstructions being formed integrally connecting two adjacent ribs.

The Prospectus of the Truthful James Mining Company.

The directors of this company expect to make ten times their money out of the public, as they do not contemplate putting their own hard-earned money into any mining enterprise. So far the company has two mining properties, for which they paid a total of $130.

Property No. 1 cost them $100, and property No. 2, $30, besides two bottles of whiskey for the embarassed prospector from whom they bought the claims. Already about $37 worth of work has been done on property No. 1, at an expenditure of $480. The directors have also paid $5 to the mining expert for his report, and have promised to print 5,000 copies of the prospectus as an advertisement for him.

No veins have as yet been discovered on the property, but one fine wall has been found to which a small stringer of smaltite was attached, which one mining expert pronounced calcite, and which, he said, would undoubtedly lead to rich silver values at depth. The property is only 6,559 ft. 3¼ in. from the Woolly Wonder mine, whose vein our expert has traced over on our property.

The company has spared no expense in securing the services of Mr. Lieswell, the mining expert, who graduated with honors at Fakerburg in 1837, and who has had 102 years and three months' experience in this branch of mining.

We quote the following from our expert's report: "The country rock is a greenish gray calcareous peroxidite, heavily mineralized with hornaceous, schmisatic magaphone granite, and is cut by violent intrusions of pink felsnapthic andorite, with rhyolusic inclusions. This gives an abundance of contacts in the property, which will increase in value as they go down. Only one contact is still lacking, and your directors must arrange for that."

In conclusion our expert states: "This is undoubtedly the finest property I have seen in the camp."

We want it clearly understood that we are not responsible for any statements made by our expert; also that none of the directors are putting any of their money into the enterprise, but are relying on the public's money entirely to make it a success.—*Canadian Mining Journal.*

Trade Treatises.

THE WELLMAN-SEAVER-MORGAN CO., of Cleveland, Ohio, has just issued circular No. CA-3, of mine cages, skips, ore cars, sheaves, dumping-cradles, and similar machinery.

THE ECLIPSE DRILL SHARPENING MACHINE MFG. CO., of Denver, Colorado, has issued a pamphlet describing the new Eclipse drill-maker and shapener. Any size and form of bit in general use can be made on this machine.

THE DEMING COMPANY, of Salem, Ohio, sends us illustrated catalogue G, on 'Pumping Machinery.' This is an attractive catalogue, of 112 pages, describing the Deming power pumps, including single and double-acting triplex pumps for various services, deep-well pump heads, artesian-well cylinders, rotary and centrifugal pumps, and all sorts of electrically-driven pumping machinery.

THE CHARLES C. MOORE CO., of San Francisco, sends us a library edition of 'A System of Engines,' and products of Harrisburg Foundry & Machine Works, of Harrisburg, Pennsylvania. This is an elaborately gotten up little book, beautifully bound and illustrated, and one of the most handsome trade publications that we have ever received. It is devoted principally to Fleming engines and power factors.

THE MINNEAPOLIS STEEL & MACHINERY CO. is sending out a little booklet giving a general idea of the scope of its industry. This company reports that it will add another building to their plant. A short time ago they doubled their foundry capacity, and when the new building is completed, will have 12 acres of floor space. This company furnishes structural steel and does erecting, builds bridges, elevators, steam-engines, Munzel gas-engines and suction gas producers, and all sorts of power connections and appliances.

Publications Received.

'Examination Questions for Certificates of Competency as Mine Inspector, Mine Foreman, Mine Manager, Fire Boss, and Hoisting Engineer as given by the State Examining Boards, together with answers prepared and edited by the editors of *Mines and Minerals*.' First edition, published by the International Textbook Co., Scranton, Pa.; 568 pages, 99 illustrations. Price, $3.50. In the preface the gradual development of the mine laws in the coal mining States of the United States is traced, especially those leading up to the Pennsylvania law of 1885, which provided for certificated foreman, assistant foreman, and fire bosses in the mines of Pennsylvania. For many years *The Colliery Engineer* and *Mines and Minerals* have published each month a set of questions as given by the various examination boards throughout the United States, Canada, and British Columbia, together with answers by the editors. These questions and answers have been arranged, all duplicates taken out, and other questions which have been collected from time to time, but which have not been answered through *Mines and Minerals*, have been added. No questions have been introduced, however, that have not been given in a State examination. This compilation, therefore, faithfully represents the range of subjects and the character of questions given in examinations for certificated mine positions in connection with the coal mines of the United States and Canada during the last two years. The questions are often answered and illustrated more fully than a candidate for the certificate would be expected to answer them in an examination, as the book is intended to be of the most possible assistance to those preparing themselves for the State examinations. None of the general principles or theories have been given other than those asked for by specific questions, as the book is not intended to replace textbooks on mining, but to be used as a supplement to such textbooks. The position for which the examination was held, and the locality in which it was held, are denoted by italics at the end of each question, for, as far as possible, local questions have been answered in accordance with local conditions. Where the questions depend entirely upon the judgment of the one giving the answer, and not upon general theoretical considerations, an effort has been made when possible to check the opinion of the editors by submitting the answer to some member of the local mining board.

The section 'Suggestions to Candidates,' gives practical advice to those entering examinations as to how to carry on the work. The last chapter of the book gives very fully the regulations of the various States governing certificated mine positions, and this is the first time this matter has been brought together in a single book. A comprehensive index and cross-index, and an elaborate table of contents add to the usefulness of the book. The scope of the book is shown by the following chapter headings: Surveying; Geology and Prospecting; Mine Gases; Safety Lamps; Inspection and Regulation of Gaseous Mines; Explosives and Blasting; Elementary Principles and Calculations of Mine Ventilation; Comparison of Airways; Splitting Air Currents; Conducting Air Currents; Measuring and Testing Air Currents; Establishing a Circulation of Air in Mine Ventilation; Mine Fans; Practical Points in Mine Ventilation; Opening a Mine; Method of Working Coal Beds; Coal Pillars; Timbering; Steam and Steam Boilers; Steam Engines; Hoisting; Haulage; Hydraulics and Pumping; Compressed Air; Electricity; Duties of Mine Officials; Miscellaneous; State Regulations Governing Certificated Positions.

UNITED STATES GEOLOGICAL SURVEY. 1. 'The Cretaceous Flora of Southern New York and New England.' By Arthur Hollick. This is Monograph L, the number in itself being noteworthy. 2. 'The Analyses of Silicate and Carbonate Rocks.' By W. F. Hillebrand. This is Bulletin No. 305 and an important treatise. 3. 'Rate of Recession of Niagara Falls.' By G. K. Gilbert. Bulletin No. 306. An interesting pamphlet by a veteran geologist. 4. 'Water Supply of Nome Region, Alaska.' By John C. Hoyt and Fred F. Henshaw. Irrigation Paper No. 196.

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Editorial.

ATTENTION IS CALLED to the fact that the offices of this journal are now at 667 Howard street, a few doors east of Third street, and close to the financial district of San Francisco.

MINING MEN will sympathize with the management of the Homestake in the difficulties caused by a fire in the underground workings. The decision to drop the waters of Whitewood creek into the mine, so as to drown the burning timbers, is heroic, and ought to prove effective, even though it entails a large expenditure of time and money. Incidentally we note that Mr. Thomas J. Grier, the manager, dismissed 500 men of that mixed breed known in the West as Dago, because they refused to go underground and fight the fire; only the American and English miners were willing to face the danger. We hope that the 1,000 stamps of this great mine may not remain idle long.

WHAT IS in a name? A great deal, if you want to suggest richness in a mine. For example, in South Dakota a mine formerly known as the Maitland, has just been re-christened the North Homestake; it is three miles from the Homestake; it is in the horizontal sedimentary formation of the Potsdam series, while the Homestake is in quartzose mica schist of Algonkian age and dipping steeply. The Maitland may be a good property, but it is Potsdam curious that it should try to borrow glory from the Homestake.

NEVADA now has a Mining and Scientific Society, the first regular meeting having been held recently at the Montezuma Club, Goldfield. The Society starts under good auspices; the president is Mr. John W. Finch, formerly State Geologist of Colorado, and now consulting engineer to the Goldfield Consolidated mines. It will be a State association of mining engineers and geologists. With so much of interest to observe and to record, the Society ought to make a name for itself. We wish it good luck.

AN UNDESIRABLE custom is creeping into technical and trade journals. Not content with giving an author's name as guarantee, with that of the editor, for trustworthy information, it has become the practice to add a foot-note stating the author's address and occupation, to the end, obviously, that he may obtain a little legitimate advertising. Next the modest foot-note becomes replaced by a longer introductory paragraph, which finally evolves into a wordy puff. As if this were not enough, we now have a picture of the author and a story of his life. A good article is its own recommendation, the editor's acceptance is another, the paper in

which it appears is a further indication of its character; the reader's intelligence should not be flouted by the methods of a patent-medicine vendor.

Copper Prices.

THE financial columns of the New York papers have had a good deal to say lately concerning the Metal Exchange in that city, and its quotations for copper. Wholesale criticism has been made and the metal trade is represented as "enraged" at the quotations of the Exchange, which are stated to be utterly misleading. While the quotations referred to are not authoritative and do not represent actual dealings on the floor of the Exchange, it happens that they are approximately correct and those behind the scenes know this to be the case, despite the rather loud protestations of several metal-selling agencies. We hold no brief for the Metal Exchange and consider it to be an organization of no particular importance, but we give some facts in order that those of our readers who are interested in the price of copper may not be misled by what they read in the daily papers. It is true that some of the large sellers, like the United Metals Selling Co., Phelps, Dodge & Co., and Calumet & Hecla, have not reduced their prices and are holding their copper at 25 cents and above, but this, under present conditions, means nothing more or less than that they are out of the market. As a result of the sharp break in the London market, it has been possible for some weeks past to import standard copper and other furnace material from Europe, refine it here, and sell it on the New York market at considerably below the nominal quotations of the aforesaid sellers. As a matter of fact, all business that has been done was effected at the lower prices, that is, around 24 cents at New York, for cash. The quotations of the Exchange are made by a committee of three, two of whom constitute a deciding majority, and the duty of this committee is to reflect in the quotations the actual transactions taking place from day to day. There is no business done on the Metal Exchange in copper, but the interests involved have always insisted that the Exchange as a matter of record should maintain a quotation for copper. That there should be so much protest against these quotations is difficult to understand because all the large sellers and buyers alike appreciate the situation fully, as well as the conditions that have brought it about. Needless to say, the disparity between the European and American markets cannot continue indefinitely, and if the large selling agencies and producers, like Phelps, Dodge & Co. and Calumet & Hecla, will persist in holding their copper until they can realize the price they are asking, the copper market will eventually have to go back to their figures, because their copper, or at least a good portion of it, is needed to fill the requirements. How long this state of affairs will continue we cannot foretell, but it can only be a question of time when, either by general lowering of values here or a rise in Europe, the conflicting factors in the world's markets will become reconciled. The industries at large have not as yet recovered from the late shock inflicted by the unpleasantness in Wall Street, and buyers throughout the country have become conservative and are inclined to follow a hand-to-mouth policy. This not only applies to copper, but to all other metals as well. On the other hand, there has been a revival in business in Europe and export sales have of late been made in satisfactory volume. However, the price realized has been on about a parity with the quotations of the Metal Exchange.

Labor Conditions in Nevada.

CONDITIONS underlying the employment of labor in the gold mining districts of Nevada present interesting problems to the mine manager. For instance, at Tonopah the union made a demand that surface men should work only eight hours instead of nine, the wages being $1 per shift for both kinds of work, on surface and underground. The operators did not see the justice of this and after negotiation between committees representing the two interests involved, it was decided to adopt a scale of wages, to be signed by the representatives of the operators' association and the miners' union. The leaders of the union objected to signing a three-year agreement, as it was contrary to the practice of the Western Federation of Miners. The operators refused to recognize the authority of an outside organization, insisting that their dealings were only with the miners working at Tonopah. So a general meeting was called by the union, to put the question to a vote. The mine managers stopped all work on the day of the meeting, so that the men might attend and no excuse be left for repudiation of the contract at any future period. The vote was favorable and the agreement was ratified. If matters have not been as pleasantly managed at Goldfield it is because of lack of unity among the operators and the excessive richness of some of the ore, making everything subordinate to rapid extraction. In a camp like Goldfield, the cost of mining becomes an academic phrase, for only the immediate profit is kept in view. One lessee went all the way to Chicago to buy a particular kind of hoisting engine that he wanted in a particular hurry; he chartered a special train and it cost him $6,000 to get that engine on the mine, but even this was justified by the short term of his lease and the richness of the ore that he was able to extract. Specimen ore provokes bad management and expensive ways; that is inevitable. Any saving seems so small compared to the daily variations in the value of the ore. It encourages stealing also. And at Goldfield, in the Mohawk mine, the stealing has been done in a reckless way. Men would come up from underground with $300 worth of ore and make no bones about it, for any fuss or attempt to search them meant a strike, and a strike would cause the cessation of exceedingly profitable mining operations, under leases the time of which was shortly to expire. Moreover, strikes are apt to be called in a summary fashion. Even the manager of a mine does not receive the courtesy of a notification, for the emisaries of the union walk to the shaft and order the foreman or shift-bosses to call the men from their labor and stop all work at once. These are among the conditions under which the production of gold is being made in the new El Dorado.

By the Way.

In connection with the recent earthquake in Mexico, we note that Mr. Robert T. Hill was interviewed recently by *The New York Times*. He said: The earth, one of the many millions of heavenly bodies, is supposed to be a cooling globe. It is also supposed, according to the best evidence obtainable, to consist within of an intensely heated 'protomagma' (the mother, interior substance) under great compression, consisting of all the known elements of universal matter, retaining the intense temperatures inherited from the time when the earth was a burning sun, and which has been incrusted by rocks, the by-products of its own combustion. As the interior substance and heat of the earth decrease through volcanic contributions to the outer envelopes of air, water, and rocks, the crust contracts and shrinks. The crust does not contract in all of its parts uniformly, however, but gives and wrinkles along certain great belts or zones of weakness, like a line of creases across a new-lain table cover. These folds, or pleats, occur along certain long lines or zones, thousands of miles in length and hundreds in width, and constitute the mountain systems of the world. The rock sheets along these zones also break, slip, and settle, making great fissures known as faults. The growing mountains are, therefore, the sites of great stresses and strains, which sometimes result in a breaking and giving way of such intensity as to shiver the whole earth. Such occurrences are known as earthquakes. The mountain ranges in different parts of the world follow different directions, and are largely of different ages. The great belts, or zones of folds and pleats, can be traced along or across the continents, but their continuity is lost at the ocean margin. It is not impossible to argue that in some instances these belts have extended nearly around the world, but usually when the geographer goes to making hypotheses of this character not founded on detailed fieldwork, he only succeeds in putting into scientific literature some great and almost ineradicable fallacy, like that of the continental backbone, which does not extend through all the Americas, as Humboldt alleged. Each great belt of wrinklings represents a geologic period of disturbance and contraction in the earth's interior. Some of the mountain ranges are very old, and quit growing many millions of years ago. In fact, some of them are so old that they have worn away so that they no longer appear as mountains, and in instances their former extent now lies beneath oceanic waters or has been obliterated by newer ranges crossing them. Movements have ceased along the sites of these older mountain systems, and hence the areas which they occupy are not subject to the great earth slips or quakes. The fact that New York lies in one of the belts of old and finished mountain making is the reason why geologists consider the city free from danger of violent shakes.

Millions of years after a great zone of pleating and fractures has been made on particular parts of the earth's surface and the movements have entirely ceased in that area, the earth begins to wrinkle in another area, and a newer mountain system begins to grow, with its axes in entirely different directions. The new belt, in turn, undergoes tremendous stresses of folding and earthquake, producing fractures, and ultimately completes its growth and ceases its groanings. Strips of the earth's surface have been wrinkled in this manner since the most remote geographic period, and are being wrinkled today. In the North American continent there have been many of these belts of mountain ranges at different intervals of time, three of which, however, are especially conspicuous and, in order of sequence, would be called the Appalachian, the Rocky Mountain, and the Antillean systems.

The Appalachian belt of wrinkles is the oldest, and its remnants dominate the easterly half of the continent. It was folded at the close of the coal-making period, which, upon the geographic calendar, is called Carboniferous period. This great system which, upon the map, apparently runs from New York to Alabama, in reality extended from Nova Scotia on the northeast diagonally across the continent in a southwesterly direction, across the Mississippi Valley, Arkansas, Indian Territory, and New Mexico to the Gulf of California. Its northeasterly end has been worn away, and the Atlantic Ocean now covers some of its former site. Its southwesterly extension was likewise degraded and buried beneath the waters of the Gulf of Mexico, which once lapped the shores of the Montana and the Nevada lands.

Millions and millions of years after the great Appalachian revolution, as it is called, the earth began to develop another belt of wrinkles, this time along the western half of our continent. It exteuded in a north-south direction, from Alaska to at least 15° of the equator, coincident with what is now known as the Rocky Mountain region, including the Mexican plateau. The last mentioned belt of wrinkles, or Rocky Mountain folds, has a north-south direction and must have been accompanied by quakes and volcanoes of enormous proportions, which mostly occurred at the close of the Cretaceous and the beginning of the Tertiary period.

In time the Rocky Mountains also ceased to grow, and rugged and wonderful as may seem their scenic phenomena, so far as the world's history is concerned, they are dead, decadent, and, geologically speaking, will soon be worn away. The north-south belt of the Rocky Mountain folds extends directly across the older Appalachian belt.

Still later our North American portion of the earth's crust started to wrinkle again, and this time along still different lines, in a curving direction from the west to the southeast, along the coast of California, across the north-south Rocky Mountain belt in Mexico, through the isthmus of Tehuantepec and Honduras across the Caribbean sea by way of the Mistirisoa and Honduras banks, to Jamaica, Cuba, Haiti, and Porto Rico. This great belt, so far as is traceable, is over 4,000 miles long, and extends from Cape Mendocino, Cal., to the easternmost of the Virgin islands, east of Porto Rico.

This belt is known to be over 1,100 miles in width, and extends from El Paso, Texas, the southern edge of the Colorado plateau, to the isthmus of Panama, the northern coast of Venezuela, and Trinidad. This belt of folding and faulting began as far back as Miocene time, perhaps a hundred million years ago. This is only yesterday in geologic time, which takes no account of years. Its movements have occurred progressively from north to southwest. This is the great zone of stress, strain, and folding movements, with the accompanying earthquakes which the earth's crust is undergoing today. The great quake of San Francisco, the Chilpancingo quake, and the Jamaica earthquake are its accompaniments.

Along this great northwestern belt will be found later geologic features of the western hemisphere, such as the Coast ranges of California, the modern volcanoes of Mexico, the isthmus of Tehuantepec, Panama, and the Great Antillean islands, and probably the oceanic islands of the Pacific. Some of the older features are the great southeast trend of the Rio Grande from El Paso to San Vincente, the southern edge of the Colorado plateau, the extinct, but wonderful volcanic foci of the little described Davis and Chisos mountains of Texas, the western Sierra Madre of Mexico, the remarkable quaquaversal ranges of northern Mexico and Texas, and the great overthrown mountains of Jamaica and the Great Antilles.

Personal.

C. S. HERZIG is in Spain.

ARTHUR L. PEARSE is at Salt Lake.

JAMES W. NEILL was at Kennett, Cal., this week.

H. E. WEST is in London, on his resurn from Siberia.

BLAMEY STEVENS is at Seattle, on a visit from Alaska.

H. R. PLATE has returned to Ely, Nevada, from Denver.

J. N. A. CONNER has returned to New York from Europe.

PHILIP C. STOESS is examining mines at Juneau, Alaska.

C. W. PURINGTON is expected at Denver from London on June 1.

E. W. BYRDE has returned to London from Kotchkar, in Russia.

S. R. MOORE has joined the Robbins Assaying Co. at Wallace, Idaho.

W. H. TREWARTHA JAMES has returned to London from Western Australia.

J. C. HAAS has opened an office as consulting mining engineer at Spokane.

J. B. TYRRELL is at Cobalt, Canada, sampling and valuing the Right-of-Way mine.

FRANK H. TEATS is now at Vanderbilt, California, with the Big 5 Mining Company.

BERTRAM HUNT is not going to West Africa, as was stated by our London contemporary.

GERALD M. BROWNE has returned from Australia to London, where he will remain.

FRANK H. PROBERT is examining the Yellow Jacket mine at Virginia City, Nevada.

W. B. THOMPSON, of Hayden, Stone & Co., New York, was in San Francisco last week.

P. G. BECKETT is assistant to the manager of the Capillitas Copper Co., in the Argentine.

R. J. GRANT and H. A. SHIPMAN are doing professional work in the Cripple Creek district.

S. F. EMMONS is making a geological examination of the Green-Cananea mines, in Sonora, Mexico.

J. GARFIELD SMITH was in San Francisco on his way from Wardner, Idaho, to Goldfield, Nevada.

H. W. TURNER is leaving Portland to direct mining operations at Kiam, Alaska. He will be absent two months.

ARTHUR F. HOSKING has been appointed Chief Reduction officer of the Tasmania Gold Mining Co. in Tasmania.

J. POWER HUTCHINS has been in the hospital at Paramaribo, Dutch Guiana, with malaria. He has recovered, we are glad to add.

ROBERT H. RICHARDS has just returned to Boston from Pennsylvania, where he has been advising in regard to iron and copper concentration.

GEORGE AMES, for several years cashier of the Utah Consolidated Mining Co., with headquarters at Salt Lake, has been appointed superintendent of the Ontario mine at Park City, Utah.

WALTER S. BROWN, of Wiard & Brown, Denver, is at present in Mexico on professional business. Upon his return he will remain for some time at the Cleveland-Arizona property near Red Rock, Arizona.

JANIN, STEBBINS & SMITH announce the dissolution of the firm. Messrs. Janin & Smith will continue as associated engineers at 804 Union Savings Bank Bdg., San Francisco; Mr. Stebbins will open an office at 1201 Chronicle Bdg., in this city.

WILLIAM YOLEN WILLIAMS with J. P. GRAVES, of Spokane, and formerly local manager of the Granby mines, at Phœnix, B. C., has been examing the Belcher mine, at Belcher camp, in company with J. P. Anderson, one of the leading stockholders of the Belcher Mining Company.

Books Received.

WEST AUSTRALIAN METALLURGICAL PRACTICE, written for the Chamber of Mines of Western Australia. A well arranged book of 200 pages, containing a description of the ore-treatment mills and processes of twelve of the principal gold mines of Australia, profusely illustrated with halftones, tables, and charts. The properties and plants described in detail are the Ivanhoe, Oroya Brownhill, Associated Northern, Sons of Gwalia, Kalgurli, Great Boulder, Perseverance, Great Boulder Proprietary, South Kalgurli, Associated, Lake View Consols, Golden Horseshoe, and Great Fingall, and the book is accompanied by 30 loose sheets of sections, plans, and working drawings. A most valuable book. Published by the Chamber of Mines of Western Australia, Kalgoorlie.

Dividends.

On May 4 the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 116 of $180,000. This makes the amount of dividends paid this year $900,000, and total to date $8,766,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, May 1.

Crackerjack	$0.34	Central Eureka	$0.80
Con. Virginia	0.93	Savage	0.81
Mexican	0.72	Sierra Nevada	0.48
Ophir	2.37	Yellow Jacket	0.90
Belmont	4.50	Midway	1.50
Combination Fraction	4.43	Montana	3.30
Goldfield Con	7.93	Mohawk	17.00
Jim Butler	1.07	Nevada Hills	4.50
Jumbo	4.10	Red Top	.....
Jumping Jack	0.20	Sandstorm	0.70
Manhattan Con	0.63	Silver Pick	1.13
Manhattan Dexter	0.19	Tonopah Ex	3.27

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
April 26	24¼	6	6⅔	65¼
" 27	24⅛	6	6⅔	65⅞
" 28	Sunday.	No market.		
" 29	24¼	6	6⅔	66⅛
" 30	24⅜	6	6⅔	66
May 1	24⅜	6	6⅔	65⅞
" 2	24⅜	6	6⅔	65⅝

ANGLO-AMERICAN SHARES.

Cabled from London.

	April 25. £ s. d.	May 2. £ s. d.	
Camp Bird	1 3 6	1 3 6	
El Oro	1 6 3	1 7 6	
Esperanza	2 3 0	1 18 0	ex div.
Dolores	1 11 3	1 11 3	
Oroville Dredging	0 17 0	0 17 6	
Stratton's Independence	0 3 3	0 3 6	
Tomboy	1 18 9	2 0 6	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices April 25.	May 2.
Blugham Central	1½	1½
Boston Copper	28⅞	30½
Calumet & Arizona	165	176
Cumberland Ely	8¾	9
Dolores	8	8
El Rayo	5½	6
Guanajuato Con	4	4
Giroux Con	9⅛	9
Greene Con	24½	24½
Nevada Con	14⅜	14¾
Nipissing	14¼	14
Tennessee Copper	39¾	41
Tonopah Ex	3½	3
Tonopah-Belmont	4⅝	4¾
Tonopah	18	17⅝
United Copper	62¼	61½
Utah Copper	29½	29¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

Mining Summary.

ARIZONA.

COCHISE COUNTY.

The site for the new Shattuck-Arizona smelter at Douglas has been chosen. The plant will be situated directly south of the Calumet & Arizona smelter. The smelter will be modern in every respect, and all the buildings, trestles, and ore-bins will be built of steel. Two furnaces, with a capacity of 200 tons per day, will be built.——A big machine shop will be built near the Junction shaft, in Bisbee, by the C. & A. and S. & P. companies.——Arrangements are about completed whereby the Wolverine & Arizona company will work its property through the abandoned Higgins tunnel.

GILA COUNTY.

(Special Correspondence).—The record made by the Old Dominion mine at Globe the past month in development and production of copper has been satisfactory. Most im-

Map of Arizona.

portant is the work accomplished on the 14th level. There has been a further enlargement of the big stope opened up in the sulphide vein from No. 2 cross-cut, from which about 200 tons of high-grade ore is being taken daily. The drift run in the vein for the purpose of giving better ventilation in cross-cut No. 3 is completed, and the driving of this cross-cut, which is now 40 ft. in fine ore, will be resumed at once. The main working drift has reached a point nearly 90 ft. beyond No. 3 cross-cut and a station is being opened from this drift, near the line between blocks eight and nine, where it is proposed to sink a two-compartment winze 200 ft., from which to develop the great sulphide ore-shoot at the 16th level. In sinking, a complete electrical equipment will be used. By the middle of the summer the first cross-cut on the 16th level will be in sulphide ore. B shaft is now well below the 10th level and connection will soon be made at that level with a shaft.——The Kiskey vein, near the east line of the Old Dominion, on the 10th level, is producing a fair quality of sulphide ore running about 8% copper, the entire drift being in ore of this grade. Development work is in progress to open this vein on the 11th level. The smelter record for the first half of April has been above recent averages. Four furnaces have been in commission much of the time and the daily output of copper is running over 400 bars.

Phoenix, May 1.

The Mineral Development Co. has notified the management of the Inspiration company that it will not exercise the option on the mine of the latter company.——At the Old Dominion, a winze will be sunk 200 ft. below the 14th level, to explore the new sulphide orebody. The Kiskey vein, near the east line, is producing 8% ore on the 10th level. Four furnaces are running most of the time at the smelter, and the supply of coke is increasing, 1,200 carloads having been recently ordered.

The operators in Globe are pleased over the announcement that the Southern Pacific will take over the Phoenix & Eastern road, partially constructed by the Santa Fe, and complete it to connect with the Gila Valley, Globe & Northern. This means that Globe will have a direct connection for both passengers and freight, to the main line of the Southern Pacific. The completion of the line from San Carlos to Winkelman is in itself a difficult task which will require much time.

PIMA COUNTY.

The Cleveland-Arizona property will ship ore regularly. The orebody on which they have been driving and cross-cutting for three weeks has shown up well and is all oxidized shipping ore, lying about 100 ft. below the surface. It is reported that the ore will run 18% copper. This property adjoins the Imperial on the north and west, and is owned by Cleveland, Ohio, men, and Percy Williams, of Tucson.

CALIFORNIA.

CALAVERAS COUNTY.

There is a chance that if the demand of the miners for an eight-hour day is not acceded to, a general strike will result along the Mother Lode. It is reported that the miners at the Utica, Lightner, Angels, North Star, and other mines at Angels Camp have made a formal demand for the eight-hour day, but have not asked for an increase in wages. The operators declare that such a change would destroy the profit and necessitate the closing of many of the mines, in which case about 500 men would be affected at Angels.

Later reports state that the miners have all struck. The vote stood 400 for the strike and 20 opposing it. The mines closed as a result of this action are the Utica, Matson, Stickle, Angels, Quartz, Crystal, and Lightner. The Utica management anticipated the strike and pulled all the motors and pumps out of the Gold Cliff, and the mules and motors out of the Cross shaft, and the company has a force of armed men guarding their property. This mine controls the situation, because its pumps handle most of the water for the camp, and when it closes the others fill with water.

ELDORADO COUNTY.

The water is now out of the 300-ft. level of the Alpine mine, and engineers will examine the property for George Wingfield, a speculator from Nevada.——The mill at the Standard Unit mine will soon start. The lower tunnel is being re-timbered.——Henry Koppikus has bonded the Clipper mine to New Yorkers. John Moore has started his quartz mill on ore from the Graydon mine.——Encouraging showings are reported from Le Boeuf mines. P. J. Stanton is in charge.——The Delwiseh mill has started again.——A cross-cut is being driven west to cut the lode in the Neptune mine, adjoining the old Trent mine on the south.

NEVADA COUNTY.

The Ethel mine, which has been idle for some time on account of water and a lack of fuel, has been opened again. Good ore has been developed in the property. Albert Maltman is the superintendent.——A small mill has been purchased by James Bros. for the mine on the Mother Mitchell ranch.——There have been encouraging developments during the last few days at the Mabel Mertz mine, a few miles from Forest City, and the old Emigrant channel has been encountered in a raise 1,900 ft. from the mouth of the tunnel. More than 6,000 ft. of tunnels and drifts have been driven to find the channel.——All top-men at Grass Valley have been given an eight-hour day by the mine operators. This change was given voluntarily, and includes blacksmiths, carpenters, helpers, and everyone working above ground. ——Good progress is being made in sinking the shaft at the Canada Hill mine, and a station will soon be cut at the

1,400-ft. point, and drifts run on the vein.——The property of the Blue Tent mine has been sold at a sheriff's sale.

SHASTA COUNTY.

Some difficulty is still experienced in the operation of the aerial tram to the Bonanza King mill, but the 40 stamps will soon be dropping regularly.——The Milkmaid, Wheeler, and Franklin mines at French Gulch have been bonded for $50,000 by Senator Jones and associates to the Western Exploitation Co., of Nevada, represented by H. F. Musser. A force of men is working there under Ed. Lewis. The Milkmaid produced $150,000 several years ago, and the Franklin is an old property, with a shaft down 100 ft.——The Mountain Copper Co. has announced an increase in pay for smeltermen at the Keswick plant. The men work eight-hour shifts, and there are 300 men on the pay-roll.——About 175 men are employed at the Blue Ledge copper mine, 30 miles from Yreka, and three miles south of the Oregon line. The mine has been under bond to the Towne company, of New York, for $150,000. This company has expended $200,000 in developing the mine, has run about 2,000 ft. of tunnels, winzes, and raises. The final payment on the bond comes due in two months.——The Mountain Copper Co. will prospect its fraction claim, near the Balaklala mine, by a three-compartment shaft that will be sunk several hundred feet. A boiler is being installed on the property, and 30 men will be employed. The first bent of the Trinity Copper Co.'s tramway has been raised. This tram will be completed in two months, and will then deliver 500 tons of ore per day to the head terminal of the Balaklala tramway that reaches to the Coram smelter.

SIERRA COUNTY.

Deep snow is still hampering mining operations in the higher altitudes of this county.——An attempt is to be made to consolidate a large number of claims near Alleghany. About 1,500 acres of mineral land, including quartz and placer locations, are involved in the deal.——A good vein has been opened in the Olivet mine, near Alleghany. This property is at the head of Kanaka creek.——A. C. Walters and J. W. Empfield have discovered a small piece of unworked gravel on Kanaka creek, from which they expect to get good returns.

TUOLUMNE COUNTY.

The litigation over the Slap Jack mine, which has caused that property to lie idle for eight years, has been settled, and the mine will be operated by the Yosemite G. M. Co., the same as before the shut-down. The last decision was rendered by the Supreme Court of the United States. The mine has a 100-ft. shaft and is well equipped with a hoist, compressor, pumps, etc., and a mill will be purchased.——A small crew is doing development work at the Mohican. The mill is not in operation, owing to the impossibility of getting fuel, and the road is impassable.——A new five-stamp mill has been purchased for the Ellen Winton mine. This property is owned by T. J. Crowley of San Francisco, and H. M. Stanley is the superintendent.——The contract for 100 ft. of driving on the Los Angeles mine has just been completed by Holland and Heinberg. A shaft has been sunk 110 ft. on this property, and three drifts have been run, aggregating about 1,000 ft., but it is thought that it will be necessary to sink deeper before a mine will be developed.

COLORADO.

SAN MIGUEL COUNTY.

A contract has been let to W. H. Mahon to complete the shaft from the Bullion tunnel, or seventh level, of the Smuggler-Union mine to the ninth level, which is the Pennsylvania tunnel, the lowest level in the mine. About 400 ft. of sinking remains to be done, and it is expected that the work will be finished in 90 days. The daily output of the mine has averaged 600 tons during the winter. Of this output, Robeson & Carter, the principal lessees, mine 300 tons per day, which is treated at the 60-stamp Smuggler-Union mill. Other lessees send their ore to the 80-stamp Pandora mill.——The material for the new Mayflower tram is being received. The tram will be two miles long and heavily built.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—E. C. Cummings, a Chicago capitalist, and Mr. Peacock, former manager for the Ladd Metals Co., have completed the arrangements for the erection of a 100-ton oil-fuel matte furnace, at Ruthberg, on the Snake river. This smelter will be used in the reduction of all minerals from the Heath mining district, and will work a great saving in length of haul for the operators in this territory.——A new placer field near the confluence of Elk creek and the American river, is being developed by E. A. Henshilwood, of Elk City. This field is near the famous old Grubstake placer, which for years proved a steady producer, first in the hands of the white man and later in the hands of the Chinese.——The development work on the Buster mine is being pushed by the owners. The mine is bonded to F. W. Bradley and other San Francisco parties. The cross-cuts at the 300-ft. level prove the lode to be 20 ft. wide, with ore of good quality. The east drift has now reached a point 75 ft. from the shaft, while the west drift has been driven for a distance of 65 feet.

Lewiston, April 27.

LATAH COUNTY.

At the Mizpah Copper Co.'s property in the Hoodoo district, the vein has been proved to be from 15 to 25 ft. wide and 200 ft. long. The value of the ore in copper is from $60 to $75 per ton. This is in the shaft. Three shifts are driving the tunnel, which has progressed 100 ft., and it will be necessary to proceed 700 ft. further before the orebody is reached, when a depth of 550 ft. will be attained.

OWYHEE COUNTY.

At Silver City, two shifts are engaged in cleaning out the adit on the shaft-house level of the Potosi, to drain the workings above. The tunnel is caved badly, making progress. Work in the No. 2 level continues, and the ore is looking good. On account of the bad weather, there is a good deal of trouble in getting the ore to the Addie mill.——The tunnel-level drift in the Banner is now in toward the south 100 ft., and the vein is widening. A drift on the same level has started north and has progressed 25 ft.——A company has been formed to work the Village Blacksmith claim, about one mile from Silver City. A tunnel has attained a length of 150 ft., and a two-foot vein carrying free gold has been developed.

SHOSHONE COUNTY.

(Special Correspondence).—The Frisco mine, one of the oldest lead producers in the Coeur d'Alene, gives promise of developing into a heavy shipper of zinc. Three thousand tons of concentrate awaits treatment by a magnetic seperator, installed on the upper part of the remodeled mill. Experiments show that the best results are obtained by applying the treatment after the product leaves the jigs. More than 15% zinc remains in the lead concentrate and experiments show that this can be reduced to 2%. It is estimated that when the two additional magnetic separators, already ordered, have been installed in the mill, the shipments of zinc will be nearly twice as heavy as the lead. Spokane electric power has been installed at the mine and the two pumps, one on the 1,600-ft. level and one on the 2,000-ft. level are being operated by electricity transmitted 100 miles. Sinking in the shaft is being continued and a station on the 2,200-ft. level will be cut in a few days. About 150 men are on the payroll.

A third dividend of $45,000 has been declared by the Snowstorm Mining Co., operating near Mullan. With the April payment of $45,000 the total dividend paid to date under the new organization amounts to $225,000. This is not all the mine had paid in dividends, for when it was under lease several years the payments amounted to more than $500,000. The treasury is in a condition to permit a larger dividend, but the management desires to retain a surplus. The shipments last month amounted to 8,600 tons, which netted an average of $10 per ton. The smelters do not make their remittances until 60 days after the receipt of the ore.——O. B. Wallace, the manager of the Interstate mine in the Coeur d'Alene, has samples of ore running well in gold, copper, and silver, taken from the No. 2 vein, and in

the 200-ft. drift. The company organized three years ago with three claims, and now has 23 claims. Thus far no ore has been shipped, but the managers expect to begin doing so in a few months. A sawmill will be built and a lower tunnel will be begun this summer.——The Superior Consolidated Mining Co. owns a group of 15 claims south of Osborn in the Coeur d'Alene. A well-defined vein crosses the holdings for a mile. A contract will be let at once for driving a 600-ft. tunnel, which, it is figured, will cut the lode at a depth of 400 ft.——Shipments of copper-silver ore will be made from the Carney group, south of Mullan, on the Wallace-Missoula branch of the Northern Pacific, early in June. The lower tunnel on the property is now in 250 ft. and has 400 ft. to go before it will cut the vein at a depth approximating 500 ft. The ore now ready for shipment was taken from the upper workings, where, at a depth not exceeding 85 ft., 33 ft. of ore averaging 4% copper and six ounces of silver, has been opened.

Spokane, April 27.

NEVADA.

ESMERALDA COUNTY.

An agreement has finally been reached between the operators and miners at Goldfield, and the men have returned to work. This has caused a rise in the market prices of southern Nevada shares, and a busy campaign will be started at all Goldfield mines.

Under the terms of the agreement signed by the union and the operators, the wage scale shall remain the same and eight-hour shifts shall continue; the miners' union shall have jurisdiction over all men employed around the mines, mills, and smelters, excepting superintendents and managers; no boycott or strike shall be declared unless by a two-thirds vote of the union; no town labor controversy shall interfere with the operation of the mines, or the employment of miners; and the terms of the agreement shall remain in force for two years.

LANDER COUNTY.

(Special Correspondence).— Tenabo has at present 300 inhabitants, consisting principally of miners. The town is growing steadily in population and number of buildings. A water system is now being laid out to supply water for both town and milling purposes. Not only is there a scarcity of building material, but labor is at a premium. Mine owners and others are unable to get enough men. Transportation from the Southern Pacific at Beowawe, 25 miles distant, is delayed by lack of teams.—— The Gold Quartz Mining Co., for which George M. Anderson is the manager, owns a group of 14 claims, and has been shipping ore for eight months. The main shaft is 150 ft. deep, with workings at the 35 and 100-ft. levels. The hoisting has been done by a whim, but they are now installing a 25-h.p. gasoline hoist. Upon resumption of work they will employ from 15 to 25 men. This company has let 12 leases on its various claims.

The Riggs-Lander lease on the Giant claim has made some rich strikes and has already shipped 15 tons of free-milling ore averaging $500 per ton. They have on their dump 150 tons of milling ore averaging $18 per ton, which is being held for the installation of a mill in the camp. The Phoenix Mining Co. is also a lessee from the Gold Quartz Mining Co. It has 30 tons of good ore sacked and ready for shipment to Salt Lake. The ore is chalcopyrite and arsenopyrite. This company has driven a tunnel 380 ft., and is employing 10 men. It has a 25-h.p. gasoline hoist on the way, and on its arrival, will sink a shaft from the surface to a depth of 600 ft. L. L. Trout is the manager.——The Gold Quartz Mining Co.'s Giant group of five claims will be patented immediately.

The Little Gem mine owned by Salt Lake men and managed by Hiram Tyree is a steady shipper and is opened to a depth of 375 ft., by an inclined shaft. Twelve men have been employed here throughout the winter, but water has been encountered lately necessitating suspension of operations until a pump can be installed. At the same time, a two-drill compressor and a larger hoist will be put in. This machinery will be in place within three weeks.——The Cortez Valley Mining Co., under the management of J. J. Cusick, is beginning operations on a large scale. It will erect a stamp-mill immediately, and will install a water system.——The Moose Mining Co., controlled by J. H. Brite and Wm. Myers, has struck rich ore on the Moose group at the 65-ft. level. This group consists of three claims, the Moose, Chloride, and Eclipse, and bids fair to become one of the best payers in the camp.

Tenabo, April 10.

WHITE PINE COUNTY.

The 2,700-ft. tunnel between the Ruth and Star Pointer workings of the Nevada Consolidated company at Ely, has been finished and the track laid. The Nevada Northern railroad is laying track up to the first railroad tunnel in Robinson cañon. The tunnel near Keystone, above Lane City, will be finished by the Nevada Consolidated Copper Co., which will transfer to this work some of the men who built the Ruth tunnel.——A Keystone drill is working on the Beaver claim near Ely.——The Ely Mines Co. is sinking a new shaft on the Badger claim.——A churn-drill will be

Map of New Mexico.

used in exploring the ground of the Manhattan-Ely. Harry Darlington is the manager.——H. B. Northrop has transferred the Paymaster placer claim to the Nevada United Mines Co.——The Tenderfoot group at Mizpah has passed to Myers & Lane.——The Chainman property is to be developed under the direction of G. E. Gunn. The old workings will be abandoned, and two new shafts will probably be sunk, particular attention being paid to the Joanna claim. ——Surveyors have completed a traverse for the line of the high-tension electric power line from the smelter power-plant at McGill, to the mines of the Cumberland Ely and Nevada Consolidated Copper companies.

NEW MEXICO.

COLFAX COUNTY.

Parties interested in the St. Louis, Rocky Mountain & Pacific railroad have purchased iron-ore deposits in Iron Mtn., near Elizabethtown. A large amount of ore is said to be available.

DONA ANA COUNTY.

Work has commenced on the new smelter to be built for the Torpedo mine, at Oregon.

RIO ARRIBA COUNTY.

A good body of copper carbonate has been opened at the 60-ft. level in the Whole mine, owned by Otto Rosenfeld. ——The Tusas company has been hoisting water from the lower levels of the Tampa mine, preparatory to starting sinking and driving operations. The reservoir, which furnishes water for the copper-leaching plant of the Tusas company, burst recently, but was quickly repaired and the mill is again in operation.

SAN MIGUEL COUNTY.

In the Rociada mining district there are many properties that have been quite extensively developed. The principal prospects of the district are: The Rising Sun, which is down 175 ft.; the Azure, 160 ft. deep; the Consolidated, with a 90-ft. shaft; the Loring, with a 125-ft. shaft and a 50-ft. tunnel; the Sam Adams, with a 60-ft. shaft and a 150-ft. tunnel; the Bessie, of the Tripod M. Co.; and the Alta M., M. & L. Co.'s No. 1 shaft, down 90 feet.

SANTA FE COUNTY.

There is a decided renewal of activity in the Cerrillos district. Mining men from Denver have been investigating the district and bonding ground, including the Cash Entry group; the Grand Central; the Mina del Tiro; and the Thomas Whalen claims. The ore carries lead and zinc, and it is stated that a concentrator will be built.

SOCORRO COUNTY.

Much work is being done in the Magdalena district. The Graphic and Kelly properties are being exploited, and each is shipping ore and will soon build concentrators.

OREGON.

UNION COUNTY.

(Special Correspondence).—Near the headwaters of the North Powder, about 25 miles northwest of Baker City, J. A. Thornson is developing a mine known as the Standard. The ore is quartz, carrying copper, gold, and silver. The vein is a fissure in granite, from two to seven feet wide, and the shoot has been proved for 400 ft. in length. It assays $33 per ton, and 650 ft. of work has been done, and a concentrating plant, run by water power, with a capacity of 10 tons per day, is about ready to start.—— Two miles below the Standard is the Royal group, consisting of three claims. On this property an adit has been run 800 ft. on the vein. High-grade ore has been encountered in this drift.—— In this district, which is just coming into notice, J. W. Messner, manager of the Indiana mine, has a promising prospect, which he is developing. The Indiana mine is on the western end of the copper belt. It is situated 25 miles northeast of Baker City. Thirty-two men are working at the Indiana. The management is blocking out 7% ore at the 300-ft. level, on a 30-ft. orebody, and is sinking another 100 ft. The pumps, hoist, and compressor are run by steam. —— The North American mine, which is one of the best-known properties on the belt, has suspended work for the present. This property was bonded a short time ago to New York parties for $1,500,000, but the deal fell through, and the company is now preparing to carry on the development itself.—— A sale is pending on the Gilkison property, to parties connected with the Bingham smelter in Utah. This property is the Copper Butte. It is owned by Jim and John Gilkison, and lies about three miles east of the North American. The purchase price under consideration is $50,000, and it is understood that the sale is assured.—— W. H. Harris of Indianapolis, Ind., has under bond the Van, Lone, and Cox properties on Goose creek, about five miles east of Copper Butte. He recently visited the camp with Chicago capitalists, and put a force of men to work in conformity with the requirements of his bond.—— On Coin creek, which empties into Goose creek, James A. Howard and associates have 15 men at work on the property of the Sovereign company, which they control. This property is considered a good prospect. The gossan capping is 100 ft. wide, and the tunnel, which they are driving to cut the vein at a depth of 150 ft., is now within 20 ft. of the ore. Much interest is centered on the result of this work, as 10-ft. holes sunk into the gossan at the surface expose the sulphides at that depth.—— To the south and east of the Sovereign, the country has been located for 10 miles, to the foot of Sparta butte.—— Activity on the eastern end of the belt continues, and a railroad is being built from Huntington, down the Snake river. The Iron Dyke mine, at Homestead, remains the centre of mining interest on the Snake. Nearly a million tons of ore are blocked out on this property, and the work is going steadily forward. The Iron Dyke is said to have been located, originally, as an iron mine, for the purpose of obtaining flux for the ores on the Idaho side of the river. The iron proved to be a capping, which gave place to copper at a comparatively shallow depth.—— In the various construction camps, between Huntington and Homestead, about 800 men are employed, and the Utah Construction Co., which has the contract for building this road, is endeavoring to increase the force to 2,000 men. Their difficulty is to get men who want to work. —— At the Ox Bow bend, on the Snake, J. D. Winslow is developing electricity to the amount of 25,000 h.p. He is completing a temporary plant of 500 h.p., but the work of adding to it will be pushed as rapidly as possible. Over 100 men are employed at this work, and more are being added to the force as rapidly as they can be found. Three parallel tunnels will pierce the Ox Bow from the Idaho to the Oregon side of the river, where the plant is being installed. The fall is 240 ft. Contracts for power have been secured for a radius of 100 miles out from this centre, and four outfits are equipping for setting poles and stringing wire along as many different lines, to the mines and towns within that area.——Pine creek, which heads in the Cornucopia district, empties into the Snake, opposite the Ox Bow, and the town of Copperfield has been laid out at the mouth of the Pine river. This new town is about six miles above Homestead. Townsite companies have been formed, and a town located on nearly every piece of land between Huntington and Ballard's Landing. The terminus of the railroad, at least for a time, will be at Homestead.—— It is proposed to build a railroad from Baker City, down Powder river, to intersect the Snake River railroad. The right-of-way is owned by W. L. Vinson, and last fall the people of Baker City subscribed $100,000 to start this line, and this subscription is yet available. Vinson is now in Boston trying to secure additional aid, and a recent telegram from him states that he has succeeded. This diagonal railroad will pass through the mining districts east of Baker City, from the Flagstaff to the Timber Canyon mine, and tap the copper belt at a point south of Sparta.—— An association is being formed in Baker City to promote the development of this mining district, and already 100 of the mining, business, and professional men have joined and pledged their support.

Baker City, April 20.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—The industry around which all interests cluster in the Black Hills is mining for gold, but there are many other minerals found here. Among these are the lithia-bearing ores, some of which are being mined and shipped, partly to New Jersey, and partly to Europe. One of these mines, belonging to W. R. Bond, is situated about seven miles southeast from Custer, and the owner has a contract to furnish ore on board cars here at $25 per ton. Another is the Etta mine, which yields amblygonite that is shipped to the Standard Essence Co., at Trenton, New Jersey. This mine, which belongs to the Harney Peak Mining Co., was the scene of the first discovery of tin in the Black Hills in 1882. A. M. Lane is the superintendent.——The mineral wolframite is in demand and is found in many mines in Custer county, and to some extent in Pennington county. This ore is found in the granite, in pockets, and in the old micacious slates; the veins, although regular in the slates, are never large, and are seldom wider than three feet.——There is no copper produced in the southern hills at this time, although there are many prospects which have excellent showings; these for the most part are in limestone, and the ore occurs in pockets. One carload from the Southern Queen ran 52% copper.——A good deal of mica is being mined in this district. The New York and the White Spar are yielding about 5,000 lb. per day of merchantable mica, which is worked up by the Westinghouse Electric Manufacturing Co. at its factory at Custer.——The Saginaw Mining Co. has ceased work in the drift on the 400-ft. level, and the men are getting out logs, and running the sawmill, preparatory to building a quartz mill, which will be of 100 tons capacity, with a cyanide annex. I. W. Herber is the manager of the mine, which is situated eight miles northeast from Custer, in what is known as the Penobscot mining district. Herman Ratte, manager of the Ivanhoe group of mines, is in

the East, where he will meet the stockholders and plan to erect a mill. This property is situated about eight miles northeast of Custer.

Custer, April 27.

LAWRENCE COUNTY.

Reports from Lead state that the waters of Whitewood creek have been turned into the workings at the 300-ft. level of the Homestake mine, to extinguish the fire which has been burning for four weeks. It is expected to take 30 days to flood the mine to the level and 60 days to clear the workings of water after the fire is out. For the next 30 days there will be a complete shut-down in all departments. The loss to the company, already, is estimated at $1,000,000, and will be double that before the mine is again in working order.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The smelter of the Keller & Indiana Smelting Co., at Keller, dependant for coke on a 26-mile wagon haul in addition to railway transportation, will probably not be in operation until a railway is built from Republic, 50 miles down the Sans Poil valley, to Keller.——A contract has been let for the first 200 ft. of the lower adit on the Gwinn mine.—— The employees of the Mineral Hill M. & T. Co., operating near Danville, have struck for eight, in place of ten-hour shifts, complaining also that the ground at and near the face of the adit, now in 800 ft., is soft and liable to cave. The company pays $3.50 per day for miners, which is satisfactory. The adit is to be driven 2,500 ft. to the vein.

Republic, April 26.

OKANOGAN COUNTY.

(Special Correspondence).—The discovery of a copper deposit in the lower adit of the Favorite mine is reported at a depth of 200 ft. The ore previously developed is silver-lead, in a quartz gangue.—— Strong indications of a pay-shoot are reported from the Little Chapaca mine. Charles A. Andrus, the manager, is talking of using power, in place of hand-drills, as soon as the Similkameen Falls Power & Development Co. can furnish electric power.—— The levels of the Ruby mine, at the base of Mt. Chopaca, are all connected, ready for stoping as soon as the Vancouver, Victoria & Eastern railway is completed to the mine.—— The lower adit of the Mountain Sheep mine, in over 1,000 ft., has intersected two veins. Drifts are being driven on one, which is 18 ft. wide, in hope of striking a pay-shoot. The vein material in both drifts is low in grade.—— At the Copper World Extension mine, 125 ft. back from the breast, on the 300-ft. level, a drift west from the cross-cut has developed a lens of ore carrying pyrite, gold, and copper, four feet wide. The company has since ordered the drills removed to the 200-ft. level, where a lens of ore 20 ft. wide has been stripped for 20 ft. on the hanging-wall side to prepare for stoping.—— A strike of gold-copper ore is reported at the end of a 250-ft. cross-cut, on the Andy Starr group. The vein is three feet, and the rich streak is from four to eight inches wide. The claims are southeast of Loomis. Another discovery of ore, near Crumb's farm, on Douglas Mtn., is reported rich in gold, silver, and copper. Several claims have been located.—— A large interest in the Trinity G. & S. M. Co. has been sold to C. Johns, of Chicago, and the working force will be increased from five to 17 men. The company will have electric service from the Similkameen Falls P. & D. Co. The Trinity mine, six miles from Orrville, is expected to be put on the shipping list. A wagon-road will be built from it over a mile, to the V. V. & E. railway. The president of the company is Edward Davis, of Spokane, the principal place of business.—— The Plant & Callahan Mining Co., with James T. Plant, G. W. Newbert, Henry Rines, and C. E. Williams, of Mora, Minn., G. P. Ward, of Alexander, Minn., S. Callahan, of Spokane, and P. Connelly, of Somas, Wash., as trustees, has been organized with a nominal capital of $1,250,000. This company has purchased the Anaconda group of four claims in Conconnulli district, near the old Ruby camp; $40,000 is reported to have been paid for the claims, which are traversed by two veins, bearing silver and copper. Sixteen years ago, report says, $10,000 worth of ore was shipped from a streak discovered in a 150-ft. adit, which assayed from $1,200 to $1,500 per ton in silver, and 2% copper. The largest vein, about 25 ft. wide, yields ore assaying from $20 to $50 per ton. Both veins are expected to be cut by a new adit, one at 400 and the other 600 ft. in from the portal.—— At the Mineral Hill mine, near Conconnulli, driving will be started at once on two veins, cut by an adit now in 1,840 ft., and the adit will be driven to intersect another vein, which is thought to be about 350 ft. farther in. This expectation is based on the relative position of the croppings. The intention is to strike the largest vein, which is wide, at a depth of 1,000 ft. The silver-lead ore will be sorted and the best grade hauled by wagons to the V. V. & E. railway for transit to the smelters. The Okanogan electric railway will pass near the property when all of the ore, it is said, will pay to ship.—— On Peacock Mtn., about three miles south of Conconnulli, the Salmon River Mining Co. owns a large group of claims, traversed by several veins. Large bodies of copper ore have been developed by surface workings. Under the direction of William McDaniel the company is starting an adit to penetrate the mountain 3,000 ft., and develop the property at a depth of about 1,500 ft. below the surface. The site selected is close to the survey for the Okanogan electric railway. It is planned to install a compressor during the summer.

Republic, April 26.

BRITISH COLUMBIA.

The strike of the coal miners has had a very depressing effect on mining activity, owing to the uncertainty of the situation, and the knowledge that if the strike should last long enough, all the smelters and mines would have to close down indefinitely. The ore shipped and crushed at the Rossland mines for the week ending April 20 was as follows: Centre Star, 1,440; Le Roi, 2,205; Le Roi No. 2, 490; White Bear, 105. Total, 4,240 tons of ore for the week.—— The contract for the main shaft at Le Roi is finished, and another contract will be let as soon as the cross-cut is made at the 1,650-ft. point to connect with the winze workings. West of the Big Josie dike, work is being pushed and it is expected that some large bodies of good ore will be developed in this part of the workings. There are about 1,000 tons of coal at the mine, and shipments will be continued as long as the railroads will accept them.——At the Trail smelter of the Consolidated company, there were received 5,152 tons of ore during the week. Besides the ore from the Rossland camp, other shipments to this plant were as follows: From Snowshoe, Phœnix, 1,499 tons; Silver King, Nelson, 645; Victoria, 80; St. Eugene, Moyie, 354; Strathmore, 31; Sunset, 31; La Plata, Kokanee creek, 46; Last Chance, 22; Duncan, 21; and American Boy, 21.——To the Northport smelter, 2,320 tons were shipped during the week from Le Roi. Two furnaces were kept in operation.

The Boundary shipments were as follows: To Granby smelter, from Granby mines, 19,686 tons; from Emma, 200. To British Columbia Copper Co.'s plant, from Mother Lode, 5,320 tons of ore; from Emma, 40; from Snowshoe, 1,200; and from Morrison, 150. To Dominion Copper Co.'s smelter, from Brooklyn, 1,440 tons; Rawhide, 1,760; Idaho, 384; Sunset, 736; Mountain Rose, 140. To Trail smelter, from Snowshoe, 760 tons; Providence, 80; Strathmore, 20. To Nelson smelter, from Emma, 30 tons. Total ore shipments for the week, 31,946 tons. The Boundary smelters treated ore as follows: Granby smelter, 19,209 tons; B. C. smelter, 9,847; Dominion smelter, 4,460. Total treatment for the week, 33,516 tons.

MEXICO.

SONORA.

The new No. 2 furnace has just been completed at Cananea. Work on 3 and 4 will be started at once. No. 1 furnace has been handling more than 400 tons per day since it was blown in. All four of the new furnaces will be in operation by June. Two new converter-stands and eight new shells have been ordered, although the converting capacity is now in excess of the matte-producing capacity of the plant.

Special Correspondence.

Chihuahua, Mexico.

The Palmilla Gets New Machinery.—Oil Process at the San Francisco del Oro.—Unwatering the Iguana.—Electric Street-railway for Parral.—Sale of Mines.—New Enterprises.—News of Mining Activity.

The famous Palmilla mine of the Parral district has recently installed three Gould duplex motor-driven geared sinker-pumps, with motors of 30, 20, and 15 h.p.; one Gould triplex geared double-plunger station pump, driven by a 150-h.p. induction motor, capacity 500 gal. per min. under an 800-ft. head. This station pump is installed at the 620-ft. level. It will increase the capacity of the pumping machinery to 1,100 gal. per min. The machinery was sold and installed by Braniff & Co., Mexican agents for the Westinghouse Co.——The aerial tramway, connecting the San Juan shaft of the Palmilla mine with the *patio* of the agency of the Monterey smelter No. 2 at Parral, is expected to be in operation in May. This is a single-cable tram with 100-kilo buckets, driven by a 15-h.p. electric motor. The towers are built of steel and the installation is well done. The capacity of the tram is said to be 100 tons per day, it was made by the Ropeways, Ltd., of England, installed by Luis Monroy Duran & Co., of Mexico City.——A 50-ton testing plant, which is in itself a complete mill, is being installed at the mines of the San Francisco del Oro, situated in the Santa Barbara district. This plant is expected to be in operation by August, and will consist of Sutton-Steele dry tables, and the Mineral Separation Co.'s oil process. If this experimental plant proves a success on this ore, a 300-ton plant will be built. Mr. Hyslop, the general manager for the company, says that this process has been worked successfully on a large scale by the Mineral Separation Co. in England, and that tests have been carried out thoroughly on this ore, but his company has determined to put up this testing plant before building the large mill, thus proving the test on a large scale. The San Francisco del Oro is now shipping approximately 50 tons per day, but expects to increase this to 100 or 125 tons in May. Mr. Hyslop states that the mines have taken out 70,000 tons of ore in the course of development, and 325,000 tons are blocked out in the mine. The development work is being pushed as fast as possible.

The American Zinc Extraction Co. has recently installed at their Tajo mine, in the Parral district, two new 80-h.p. boilers, completing their battery of 360 h.p. A new Wellman-Seaver-Morgan Co. double-drum hoist has been installed at the main shaft, together with a new head-frame, ore-bins, tramways, etc. Underground, a new duplex Prescott sinker is holding the water at the 200-ft. level. The mine is now one of the steady shippers of the district, and Mr. Swain, the manager, says that the shipments will be increased and the development work pushed.——The Benito Juarez Mining & Land Co., which recently purchased the Benito Juarez mine in the Parral district, is developing this property as fast as possible, under the management of D. F. Riddell. The shaft has been sunk to the 180-ft. level, and at this level they have a 150-ft. drift to the south. The company now has its own assay plant, and is erecting the necessary buildings at the mine for the accommodation of the machinery. A new 30-h.p. Weber gasoline engine has recently been installed.——The Iguana Mining Co., under the management of A. R. Grigsby, is now unwatering the Iguana shaft, having recently installed a new 80-h.p. boiler, giving a boiler capacity of 120 h.p., and a new 200-gal. Wilson-Snyder sinking pump. As soon as this shaft is unwatered, they will cross-cut to the vein at the 200-ft. level, and continue sinking the shaft to the 500-ft. level.——The new milling and cyanide plant of El Rayo Co. is expected to be in operation in May.——A contract has been awarded McQuatters & Trueheart for the construction of an electric street-railway in the city of Parral. This road will be approximately 4½ km., and will operate, beside the passenger cars, platform-cars for handling freight from the station of the Mexican Central and the Parral & Durango railroads to the city. The new company is known as the Urban Rural & Mining R. R. Company.

The Los Muertos mine, on the Veta Colorada, under the management of Floyd R. Thompson, has increased its production since the first of the year from 800 to 2,000 tons per month. Mr. Thompson reports that he has opened up some good orebodies recently, but at the present time is paying more attention to the development than the production. He also states that they are contemplating the erection of a large mill to treat the low-grade ore.——The Clarinas mine, in the Santa Barbara district, and the adjoining claims called the Reforma group, which was recently sold by Grant Gillette to Howell Hines and associates, will soon be equipped with four new hoists, air-drills, and the necessary machinery for the full development of these properties. A railroad switch will be laid to connect these properties with the Mexican Central at Santa Barbara station. Power for the operation of the machinery will be purchased from the Tecolotes plant.——T. C. Williams, of the Hidalgo M. & M. Co., operating the Delfina mine in the Cienega de Olivos district, reports conditions favorable at that property. The company has just made a shipment of ore running 24% copper, and 600 to 700 gm. silver per ton.

Butler and Cooper, who are now working the Perros Bravos properties of the Pittsburgh Mining Co., at Santa Barbara, have taken options on the San Rafael, La Cabriza, Las Auris, La Quroa, and Los Pinos properties, belonging to the same company. They will start development work at once.——The Guadalupe mine, owned by Vicente Visconti, of Santa Rosalia, and situated in the eastern part of the Parral district, has recently been examined by Mr. Harris, engineer of the American Smelters Securities Co. This is a copper property with some ore blocked out.——The foundations and buildings for the new power-plant at the Capuzaya mine are completed. The machinery is said to be on the way. The electrical part of the equipment is Westinghouse. Work has been suspended at the mine until the power-plant is completed.——The 3,000-h.p. gas power-plant of the Minas Tecolotes y Anexas at Santa Barbara has been completed. The new machinery consists of Loomis-Pettibone gas producers and Crosby engines, with double acting units.——The Buen Viento mine in the Parral district, owned by the Buen Viento Mining Co., is replacing the gasoline hoist with an electric hoist in order to hasten the development of this property. C. F. Gerhardt has charge of this work.——The Esmeralda group of mines in the Parral district is now under examination by Philadelphia people.

The Americana mine in the Terazas district, now being operated by a Boston company, has three large pumps in operation unwatering the mine. George Boyce is the manager.——The Madronas property in the Santa Barbara district is being worked by J. F. Johnson, of Parral. Good ore has been reported in the bottom of the shaft. ——The spur connecting the Cigarrero mine in the Almoloya district with Baca station on the Mexican Central railroad is expected to be completed early in May. ——The new owners of the Central Lucia mine in the

Chorreros district expect to equip this property with new machinery throughout, the old machinery being in bad condition. This property was recently sold by Mr. Hathaway.——G. A. Burr has formed a new company of Philadelphia people to take over the Los Mechos property, which lies north of Indé. The new company is called the Los Mechos Mining & Smelting Co.——A. Spencer Crago, of the Gladys Proprietary, Ltd., reports a rich strike at El Bronce mine in the Roncesvalles district. Mr. Crago has been sinking here for twelve months, and is now down 230 ft. vertically, and in good ore.

The new machine shop of the Parral Power Reduction Co. is already crowded with work. At the present time they are overhauling and reconstructing two engines of the Mexican Central railroad. The new foundry is completed and will be blown in at once. The power-plant is in operation, supplying power to the district.——The approximate production of Parral for March, as given by the *Parral Miner*, was 21,567 tons, disposed of as follows: Shipped to smelters, 10,242 tons, locally treated, 11,325 tons.——The Prieta mine at Parral is to resume operations in the near future. New machinery is reported to be on the road, the electrical part of which is furnished by the General Electric Company.

Cobalt, Ontario.

Railroad Facilities.—Prospectors Are Active.—The Temagami Reserve.—Output of Mines for First Quarter.

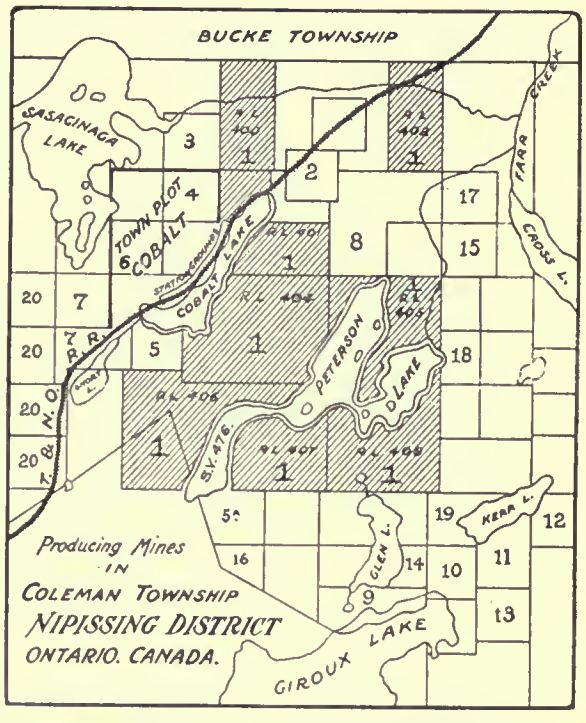
The Government railroad that affords entrance to Cobalt and other mining camps of northern New Ontario has, in connection with the Grand Trunk railway, inaugurated a new service between Toronto and Cobalt. The distance by rail is 330 miles, and leaving Toronto at 9 P. M. the train arrives at Cobalt at 8:15 the following morning. This gives the visitor an opportunity to spend the day in the camp and return to Toronto by the 8 o'clock train the same evening. Two Pullman cars and one first and one second-class car make up the train, and the indications are that a third Pullman will have to be added shortly.

In the woods there is still two or three feet of snow, but bare spots are appearing on the hill-tops and in the clearings. The rivers and lakes are still frozen over and hurried and sometimes desperate efforts are being made to transport supplies up to the more northern points before the ice breaks up. It was feared two weeks ago that the ice on the Montreal river was breaking up, and as high as $130 was paid per team for a trip that occupied three days. Parties taking in supplies to Larder lake were charged even more than that, and Robert Tighe was asked $800 for transportation of a gasoline launch 20 miles. He, however, was an old campaigner, having had experience in both commissary and transportation departments in South Africa and British Columbia, so he took charge of the undertaking himself. As a result, his launch is now on the frozen banks of Larder lake awaiting the opening of navigation.

The district north of Latchford in the townships of James, Smythe, Tudhope, Barber, and the great Temagami Reserve are attracting many prospectors. This Reserve is owned by the Province of Ontario and comprises 100 square miles. It was originally set apart as a great timber reserve and a special permit is required to prospect. Fire rangers are on the look-out and demand production of a permit from everyone on the ground.

The output of Cobalt proper for the first three months of the present year has been encouraging. The bad roads and the installation of new plants have been responsible for some delays in the case of new shippers and the non-appearance of some of the regular shippers. Cobalt's output for the first quarter has been 2,898 tons, or an average per working day of 37 tons. This will be equally divided between first and second-grade ore. The Nipissing leads the list with 817 tons; then the O'Brien with 639 tons. The Buffalo comes third with 302; then the Tretheway with 216, and its next-door neighbor, the Coniagas, with 206 tons. La Rose shipped 187 and the Silver Queen 110 tons. The Tretheway made no shipment during January, being engaged in the installation of plant, and, for a similar reason and the absence of power, the Coniagas was closed down for one month.

The mining tax bill has been passed by the Ontario Legislature without any essential change in its details. It provides for a tax of 3% on all profits of mines over $10,000 a year, and an average tax of two cents per acre



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Tretheway Silver-Cobalt Co.
4. Coniagas Mining Co.
5 & 5 A. McKinley-Darragh.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay

on all mineral lands in inorganized districts. The lands in organized municipalities being already liable to assessment for municipal taxation. Another measure affecting mineral lands was introduced, dealing with a large class of holdings in the settled districts in which the surface rights only of the land have been sold, reserving the mineral. The latter when undeveloped, has escaped taxation, all local taxes being levied on the owner of the surface. An amendment to the law was introduced making the mineral rights assessable. This was regarded as too sweeping, and likely to discourage investment, and was subsequently modified so as to make it applicable only to "petroleum rights" in place of "mineral rights" generally, in which form it was finally adopted.

Another important measure passed was one introduced by the Government guaranteeing the titles of the purchasers of the mining rights to the beds of Cobalt lake and Kerr lake, which were purchased from the Government for $1,085,000, and $178,500, respectively. An action brought by the Florence Mining Co. against the Cobalt Lake Mining Co. disputing their title on the ground of a statutory right created by prior discovery, is now pending. The bill was keenly opposed, and amend-

ments were introduced to the effect that the rival claimants should be given an opportunnity to make good their claims in court, and should secure compensation if successful in doing so, but these were defeated, and the bill passed as it stood.

The owners of La Rose mine have filed a claim against the Government for the whole of the royalties collected from the output of the O'Brien mine, amounting in all to some $54,406 up to date, being 25% of the value of the ore mined. They make this demand on the ground that when the Government brought suit against the O'Briens at the instance of La Rose interests, who claimed the location as bona fide discoverers, the suit was subsequently compromised on the agreement of the O'Briens to pay the Government a royalty, and the claim of La Rose owners were ignored. These cases illustrate the uncertainty and confusion still prevailing in the matter of titles to mining locations, and are hardly calculated to reassure investors as to the security offered by an ordinary title.

Denver, Colorado.

Conference of Governors.—Cyanidation at Cripple Creek.—Use of Water-Power.—Copper Resources.

The Governor of Colorado has lately issued an invitation to the governors of 15 States to join in a conference upon the best methods of securing the development of the West. This is as it should be. Co-operation is the first requirement for the attaining of large results, and it is to be hoped that this conference of executives may meet, and see its way clear toward bringing about some substantial progress in the upbuilding of the West. And in this connection mention should be made of the meetings of the Irrigation Congress and of the Mining Congress, which have served to draw the men of similar interests together for the exchange of ideas, the stimulus of mutual effort, and the greater achievement of co-operation.

The ways of the promoter are many and devious. One of his lures is a diagrammatic sketch showing a projected tunnel boring its way through the face of nature, under hill and dale, cutting in its course anywhere from five to a hundred veins that extend down to the everlasting depths; carefully omitting to state that these veins, if they ever are cut, are more than likely to be represented by a barely discernible crack, an unmineralized zone of fissuring, or a vein that, though mineralized, is too low-grade to work. But photography can also be bent to meet the schemer's purpose. A recent advertisement shows what purports to be a huge dump, indicating the enormous amount of development work done. The photographer, by the aid of an imperfectly aplanatic lens, and by getting downhill from the dump, is enabled to make a few tons of rock loom up in a way that is familiar to every beginner with the camera, who has forgotten to remove the feet of his subject from the foreground. Such methods savor so strongly of dishonesty as to deserve the hearty condemnation of all mining men.

Recent progress at Cripple Creek includes the starting of the construction of a 1,500-ft. dam to impound the tailing from the mill of the United States Refining & Reduction Co. The new tailing-plant of the Portland Gold Mining Co. is in full operation, and yielding satisfactory results. The new mill of the Golden Cycle Mining & Milling Co. expects to be handling 800 tons per day within the next month. The four new Edwards roasting furnaces installed by this company have made a satisfactory showing in a preliminary run. The Consolidated Copper Creek Co. is considering the erection of a cyanide mill at the mine, and there is thus a notable number of cyanide mills already in operation or nearing completion. The dividends paid by Cripple Creek companies during April amount to $256,627; among the mines paying dividends are the Portland, Vindicator, Mary McKinney, and Elkton.

The utilization of water-power to generate electricity and the transmission of the latter a long distance to supply the needs of towns, mines, and reduction works has progressed wonderfully in recent years in Colorado. Many plants are already in operation, and within the last year at least three more large new companies have been chartered. One of these is in Gore cañon, and the other two are on the Grand and Taylor rivers, respectively. On the Arkansas river, in Chaffee county, a low head is being utilized in connection with the new smelter in course of construction there. This is expected to have a capacity of 300 tons daily, and is to use a patent process known as the Kuenzel, a feature of which is the use of oil as a fuel. It is claimed that the company will be able to smelt its ores at a cost of 45 cents per ton—whereat the old smelterman smiles and says nothing.

The development of the copper resources of the Front range has been the subject of a recent talk by R. A. Trevarthen. Mr. Trevarthen observes, with a good deal of point, that there are copper veins in the Front range that are quite as good as many of those found in other more remote districts now being boomed. When strawberries are ripe, prunes receive little attention, though welcomed in the winter. Similarly, low-grade copper deposits that could be worked on an adequate scale at a substantial profit are likely to receive little attention when occurring in proximity to larger and more valuable deposits of gold and silver, though if situated in a region not so enriched by the precious metals they would be regarded as possessing great possibilities.

Butte, Montana.

Production of Copper in April.—A Decrease.—Affairs of the Raven.—United Copper and Heinze.—Vein in the Amazon-Butte.—Colusa-Leonard Extension.—Butte & Bacorn.—Successful Explorations.

The copper production of the Butte mines in April was 27,673,200 lb., or 3,000,000 less than in March. The mines of the Boston & Montana Co. were closed for a little while on account of labor troubles. The ore mined and copper produced by the different companies during the month were as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	99,000	7,227,000
Anaconda	114,750	7,512,000
Butte & Boston	14,400	936,000
Washoe	11,700	737,100
Parrot	9,000	558,000
Trenton	11,400	695,400
North Butte	40,500	3,645,000
Coalition	42,750	3,035,250
Origiual	27,000	1,728,000
East Butte	4,500	360,000
Pittsburgh & Montana	6,900	538,200
La France	6,000	420,000
Miscellaneous	3,750	281,250
Total	391,650	27,673,200

The daily average output of ore by all the mines was 13,055 tons, and the daily average copper production was 947,440 pounds.

There is much doubt as to the ability of the Raven company to acquire the interests of the Amalgamated and Trenton companies in the Snoozer and Old Glory lode-claims, though an agreement has been reached with J. B. Leggatt for the purchase of his interest in the Old Glory, amounting to seven-twelfths. Without the Amalgamated interest in the property the Raven would have little use for the Old Glory, as for the Snoozer,

since the Butte Coalition Co. owns an interest just large enough to prevent the Raven company from operating the property whenever it chooses. Stockholders of the Raven have been hopeful that for the good of all concerned the Amalgamated and Coalition companies might be induced to part with their interests. Negotiations have been under way for some time, but with no success up to date. It is possible that some understanding will have been arrived at by the time the special meeting of Raven stockholders is held in Butte on May 15, when it will be decided if the capital stock is to be increased from 500,000 to 1,000,000 shares.

During the recent investigation of United Copper affairs through court proceedings in New Jersey, persons formerly identified with Amalgamated and Coalition testified that the total price paid United Copper for its Butte interests was $10,500,000, but Heinze interests claim the price was in excess of that figure. United Copper officials have declined to give a list of the company's present holdings, on the theory that such publicity would defeat negotiations for the acquisition of other property and interests. It has generally been understood that United Copper owns the La France Co. which is operating the Lexington mines in Butte, and that the Heinze interest in the Davis-Daly Co. is an asset of the United Copper, but that is not certain. It is pretty well understood, however, that United Copper owns properties in Montana, Idaho, Washington, Utah, Arizona, and Mexico, and probably some in British Columbia. F. A. Heinze, since the sale of his Butte properties to the Butte Coalition, has been active in the search for new properties for the United Copper to take the place of those sold, and his friends say he has been successful, and now controls a lot of dividend-paying mines.

A vein of 7% copper ore, four feet wide, has been cut in the shaft of the Amazon-Butte, one of the new companies operating on the east side of the district. A portion of the vein is sulphide and carries high-grade ore. The shaft is 360 ft. deep. The officials of the company feel confident that it is a persistent vein and that it will be found large and full of ore a few hundred feet deeper. A station will be cut at 400 ft., and some cross-cutting will be done at that level. The Amazon-Butte lies south of the Bullwhacker, from which tributers are shipping 100 tons of ore daily. The Bullwhacker, however, is a north and south fault-vein, and the ore is regarded by some mining men as a 'blow out,' while the Amazon-Butte is on east and west veins, the characteristics of which are identical with the big permanent lode of the Butte district.

The Colusa-Leonard Extension Co. is cutting a station at 600 ft. and it is now the intention of the company to do some exploration work at that level. It is believed that a vein, from which some fine looking stringers have been cut in the shaft, will be found a short distance to the south.——The Belinda shaft of the Butte & Bacorn Co. is 850 ft. deep, where a station is being cut and a pump will be installed. No other work will be done there, but the shaft will be carried down to at least 1,000 ft. The shaft of the Calumet, which is not far from that of the Belinda, is down about 830 ft. Some big veins have been opened in both mines, but at the depths where the work has been done they do not carry commercial ore. The fact that the veins become more highly mineralized in depth is satisfactory evidence to manager Bacorn that it is only a matter of sufficient sinking when the company will have productive mines.——Twenty inches of copper glance and three feet of ore carrying from 7 to 10% copper has been encountered in the Alex Scott mine by the Butte-Montana Co. It was found in a raise on the 600-ft. level about 135 ft. east of the shaft. The Alex Scott shaft, with three compartments, has been completed to a depth of 900 ft., where a station is being cut. When this is completed, sinking will be resumed, and the shaft taken to a depth of at least 1,200 feet.

Salt Lake, Utah.

Transfer of Annie Laurie.—Shipments From Tintic.—Uncle Sam Finds Ore.—The Emma Re-opened.—Annual Report of Daly-Judge.—Railroad to Pioche.

The Annie Laurie mine and several adjoining properties in the Gold Mountain district have passed into the control of Albert Carr and associates, of New York. It will be operated hereafter under the name of the Gold Mountain Consolidated Mining Co. It is the intention of the owners to erect a new mill to treat from 500 to 1,000 tons of ore daily. The company controls 2,500 acres.

The management of the Utah Copper Co. has the first unit of its new concentrating mill at Garfield ready for operation. It is anticipated that the start will be made not later than May 15.—— The Bingham Amalgamated Copper Co. is said to have secured options on the Tiwaukee and Congor groups, situated near the Copper Glance possession of that corporation.

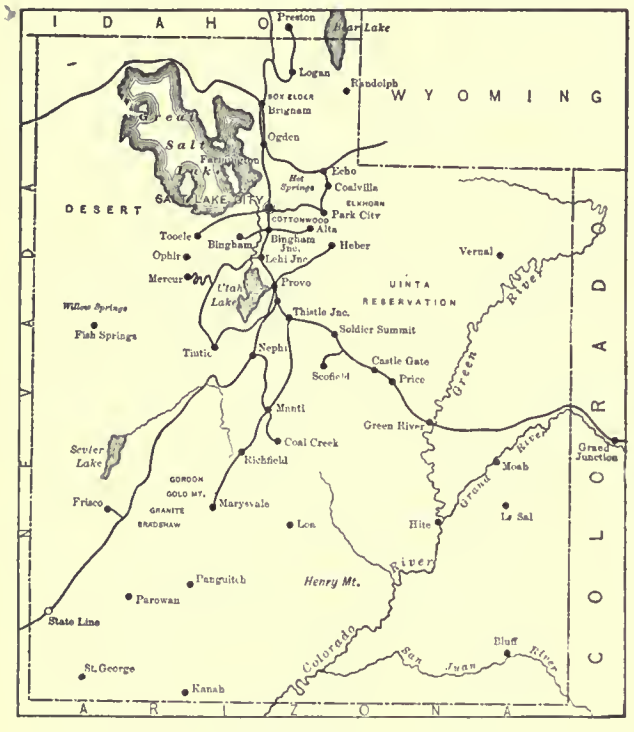
The ore shipments from the Tintic mining district last week amounted to 163 carloads, the shipping mines and respective amounts being: Ajax, 4; Beck Tunnel, 12; Bullion Beck, 6; Carisa, 5; Centennial-Eureka, 51; Colorado, 6; Eureka Hill, 2; Eagle & Blue Bell, 5; Gemini, 5; Godiva, 4; Grand Central, 6; Lower Mammoth, 7; Mammoth, 18; May Day, 2; Ridge & Valley, 3; Scranton, 6; Shoebridge Bonanza, 2; Tintic Iron, 4; Uncle Sam Con., 4; Victoria, 3; Yankee Con., 8 carloads.—— The Uncle Sam Con. Mining Co., has found a large body of ore in a cross-cut from the bottom of a shaft sunk 250 ft. below the Humbug adit. The strike is considered to be most important, and caused a strong upward movement in the stock. The Colorado Mining Co. is driving for an orebody on the 300-ft. level. Shipments have been resumed from this property after a temporary cessation due to the bad condition of roads.—— Negotiations are still pending for a consolidation of the May Day and Uncle Sam mines at Tintic.

The famous old Emma mine, in the Alta district, has recently been acquired by Jesse Knight and associates, of Provo, Utah.—— The Cliff Mining Co., at Ophir, in Tooele county, owner of the Buckhorn mine, after a long period of preparation, has begun to produce regularly. The new aerial tramway is in commission and handling 50 tons of ore daily. Several new mine-buildings have been erected, and physical conditions underground are said to be most satisfactory.—— The Independence Gold Mining Co., operating at Gold Springs, in Iron county, has purchased property between its own domain and that of the Jennie Gold Mining Co., and will push development.

The annual report of the Daly-Judge Mining Co., operating at Park City, has been issued. At the beginning of last year the company had an indebtedness of $230,976, represented in $209,000 worth of outstanding bonds, and an overdraft at the bank of $21,976. This debt was entirely discharged, and at the close of the year the treasury contained a balance of $269,038; the net earnings for the year being $500,015, or 61.2% of the gross earnings. A total of 63,322 tons of ore was mined, 13,011 tons being of shipping grade. The mill treated 58,845 tons, from which was obtained 9,838 tons of lead concentrate, and 8,320 tons of iron and zinc middling, showing one ton of concentrate produced from each 3.2 tons of crude ore. The mill handled an average of 165 tons per day. Owing to the impoverishment of the ore-

body on the 1,500-ft. level, the production of crude ore has been reduced, and consequently there has been a falling off in the earnings. About 2,000 ft. of development was done in the mine during the year. The total production since the incorporation of the company has been 1,068,346 oz. silver, 3,544 oz. gold, 28,961,777 lb. lead, 12,188,260 lb. zinc, 156,110 lb. copper, which sold for $1,279,076.

The construction of the railroad into Pioche from Caliente, Nevada, is being pushed ahead rapidly, and the camp of Pioche is taking on a lively appearance. Mine operators are preparing to work their properties upon a large scale. Among the number will be the Ohio-Kentucky Mining Co., and the Phœnix Reduction Co., both of which are controlled by Salt Lake parties. A



Utah.

compressor plant has been ordered for these mines. E. L. Godbe, of Salt Lake, is manager.

London.

Cornish Mining.—Operations at Dolcoath.—Reopening of Old Mines.—Mt. Boppy Gold Mine.—Returns From the Indian Mines.—Satisfactory Yields.

As regards production, no marked improvement is visible in Cornish mining during the first quarter of the new year, although there is promise for the near future in the properties that have been taken in hand by Cornish Consols and its allied companies. This group of financiers is not responsible for the operations at Dolcoath, except as owners of the 'dues.' In that respect, probably from the point of view of the executive, the transfer of the mineral rights has not had the effect of facilitating the rapid development of the premier mine on the scale hoped for. It is rumored that the price named by the new landlords at which the dues might be compounded by the mine was £250,000 while the directors offered £80,000. Until this bargain is concluded or definitely off Dolcoath may be expected to show a masterly inactivity, nursing its resources for independent action when the circumstances become more propitious. The wisdom of this policy depends on the price of tin, and in some quarters where foreknowledge of the course of the markets may well be looked for, the certainty of the continuance of the present value of the metal is considered as by no means assured. For the first 12 weeks of the year, from January 1 to March 23, inclusive, 355½ tons of block tin and 28½ tons of slime were sold by Dolcoath at average prices respectively of £120 19s. 8d. and £89 6s. 3d. per ton, the total realized having been £45,656. The quantity of ore crushed during this period was 25,637¾ tons. Compared with the corresponding period of last year the returns of black tin show a falling off of about 23 tons, but there is an increase of total value of £4,700, due solely to the rise in tin. The report for March from Carn Brea & Tincroft is described as showing some improvement compared with that of the previous month, but the continued breakdowns in the pumping and other plant of these mines point to the necessity for a thorough overhauling of that department. Judging from the tone of the proceedings at the statutory meeting of the Cornish Development Co., the outlook for the stockholders appears to be hopeful. This company is allied with Cornish Consols in the working of South Crofty, and the directors expect dividends on their investment in that mine up to 100% by next year. Another property in which this company is jointly interested with Cornish Consols and one or two other newly formed groups, is the Wheal Sisters, a group of four mines in the neighborhood of St. Ives. Those four mines returned large tonnages of tin down to the time when they ceased working from the fall in the price of metal and from lack of working capital. The companies interested, which are all strong, with ample funds, are joining together to unwater the mine and bring it to a producing stage, with a view, either of retaining it for dividend purposes themselves or floating it off into a separate company as may appear best later on. They have agreed to put up £20,000 for the purpose of unwatering, and are prepared to provide a further £20,000 when it is required. The engines for unwatering this mine have been on order for some time, and should be delivered by the end of June. The order for these engines was in the shape of two units of gas-suction engines of 150 h.p. each. The order went to the British Westinghouse Co., together with the order for the necessary dynamos and electrical equipment.

Mount Boppy now holds the proud position of being the premier gold producer in the State of New South Wales. At the eighth general meeting of the company this week it was stated that the milling capacity has been augmented to the extent of over 60%, which has given an increase of ore milled exceeding 21,000 tons. The percentage of gold extraction from the residues has improved beyond previous records, with excellent prospects of doing still better. The production has increased over that of the previous year by nearly £10,000. The reserves of ore, which last year were 182,000 tons, now stand at 191,000 tons, notwithstanding that 72,976 tons have been extracted from the mine, and have passed through the mill during the past twelve months. The sales of gold for the past year amounted to £126,229 and the gross receipts to £127,261, as compared with £116,870 for the preceding year. The working costs and total expenditure in Australia and England amounted to £64,134, which left a profit of £63,127, against £65,172 the previous year. The difference of £2,045 in favor of 1905 is accounted for by the fact that 21,098 tons of ore were milled in 1906 in excess of 1905, which, while increasing the aggregate milling cost, produced nearly £10,000 worth more gold. The superintendent has pursued the policy recommended by Mr. William Frecheville of working, with his rich reserves, a larger proportion of the lower-grade ore in the mine, in order to ensure the even continuity of its life. Mr. Frank Taylor, of John Taylor & Sons, in the course of his address said that early in August they received the welcome news

that, in addition to the rich ore which had already been developed at the 400-ft. level, the deepest in the mine, a new orebody of great width and richness had been discovered at about 800 ft. south of the main shaft. Since then this new discovery has opened up remarkably well, developing a valuable addition to the reserves. Besides this there are other important and successful developments proceeding at this level, which encourage the management to look forward to finding rich ore when the vein is explored at greater depth and also westward. The developments at this level continue good, and sinking below it is to be commenced.

The Indian returns for last month from the mines under the management of John Taylor & Sons are regarded as satisfactory. The Mysore production of 17,376 oz. (which includes 480 oz. obtained from steaming the plates) compares with 16,122 oz. in February. Although the destruction of a portion of the dressing floors by fire recently has necessitated a temporary reduction in the tonnage treated, by milling quartz of slightly higher grade than usual, the output has been well maintained. Champion Reef produced 10,607 oz. last month, as against 10,236 oz. in February, but the ore milled was increased by 1,070 tons. During the four months from October 1 to January 31 60,766 tons of quartz were crushed and 80,980 tons of tailing treated by cyanide, for a total yield of 45,687 oz. of gold worth £173,537. For the corresponding period last year, the output from 78,260 tons crushed and 67,743 tons cyanided was 70,617 oz. gold worth £270,435. Nundydroog last month yielded 6,146 oz., or 310 oz. more than in February, and improvements are also shown by Ooregum, which produced 5,642 oz., as compared with 5,584 oz. in February, and by Balaghat, whose output was 3,132 oz. as against 3,074 oz. in the previous month. A cablegram from Dharwar Reefs gives the result of the first crushing, exclusive of the cyanide return, as 510 oz. from 1,494 tons crushed, or an average of about 7 dwt. per ton. The assay-value of the tailing is 4 dwt. 5 gr. per ton, of which it is probable nearly 4 dwt. can be extracted. This would be equal to a yield of about 11 dwt. from both sources.

Johannesburg, Transvaal.

Political Conditions.—Disappointment Over the New Government's Attitude.—Labor Conditions.—Mining Outlook Distinctly Bad.—Withdrawal of Capital From the Rand.—A Locust Storm.

At a banquet given in Pretoria to General Botha and the members of his ministry, the Premier made a speech that has encouraged people to hope that a way would be found out of our difficulties, both industrial and political. That was nearly a fortnight ago. Today the feeling of despondency has re-asserted itself, after the first brief session of the Transvaal parliament. The whole mining community awaited with keenest interest the pronouncement of the Government upon the question of unskilled labor. The speech from the Throne dealt with the question in a very vague way. It was stated that the Chinese would be sent out of the country as soon as possible. Sir George Farrar, the leader of the opposition, endeavored to force the Government into an avowal of a definite policy, and one of the Progressive members tried to get a commission appointed to enquire into the question of the unskilled labor supply. But the Government used its big majority to squash all discussion on the one question that is agitating everyone.

We are now in a quandary. Parliament does not meet again until the middle of June. The first batch of Chinese finish their contracts in June. These coolies will have to leave the country. Before the end of the year there will be 20,000 time-expired Chinese. It will be impossible to fill their places with Kaffirs.

It looks as if the policy of the Boer Government is to be one of drifting. They will utter nebulous platitudes about the necessity of supplying the mines with unskilled labor, but do nothing. As the contracts of the coolies run out, they will allow them to go back to China. It matters not to them if some of the mines close down, or if the others work half-time. In fact, this is the declared policy of their leader, who on many occasions has stated that it is far better to make the mines last two hundred years than to work them out in fifty years.

In face of this policy of Het Volk, it is ridiculous to look for any big expansion in the Transvaal. Contraction seems almost inevitable. It is highly probable that the zenith of the Rand has been reached, and that the future will be humdrum. The eventual closing down of some of the poorer mines, say in the next couple of years, seems inevitable. The distress in our midst will not grow less. It is to be hoped that other countries will follow Australia's example, for she has helped her stranded citizens to get back to their native land.

Capitalists who for years have confined their attention to the Rand, are beginning to tire of the uncertainty here, and are quietly sending their engineers to other countries, South America, Mexico, and the United States, to spy out those lands. Until the labor question is settled once and for all, and settled satisfactorily, it is a great mistake for investors to put their money into Rand ventures.

There has been any amount of grumbling on the part of the public, over the municipal power-station. This is the largest station in the world using producer-gas entirely, for generating power. The number of breakdowns has been appalling. The whole electric tram-system is sometimes hung up for hours, and as this generally happens on Saturday nights when there is the greatest traffic, there is much inconvenience. Producer-gas engines have not been a success here. This failure teaches the old lesson, so necessary in mining, to be careful how you adopt new methods. Better pay a bit more and be sure of your power. This experiment has cost the community thousands of pounds.

One of the worst locust storms recorded in the history of the Transvaal swarmed over the city and mines a day or so ago. The invaders carried everything green before them. Stretches of green veldt were wiped out in a night and next day the color was a brown, as if winter had come suddenly. At nights the locusts piled up on the railroad tracks, and great inconvenience was caused. So slippery did the wheels become that sand was thrown on the rails. Most of the trains have been arriving late. It seems incredible that such insignificant invaders as locusts should cause such havoc, but when one is told that the cloud was over twenty miles long and eight miles wide, it is seen that the pest has done the damage by sheer weight of numbers. The market gardens in many sections have been completely ruined. A small field of corn belonging to the writer was wiped out by the invaders in one day, and men who have toiled for weeks in gardens looked on in despair to see their labor destroyed in a few hours. This storm is moving steadily northward, and will destroy the promising crops that this year's fine rains have made possible. And yet, you will hear people spout about the agricultural possibilities of the Transvaal, whereas it is one of the most accursed countries from the agriculturist's point of view in the world! "It's an ill wind that blows nobody any good." The Kaffirs have caught sacks of locusts, and are having feasts. Unfortunately there is no wild honey to go with the locusts. The Chinese also have remembered how they eat these insects in their native land, and they also have gathered bushels of manna—I mean locusts.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

VIRGINIA has been the most prominent producer of manganese ores in the United States, and with but six exceptions has ranked first for the last 26 years.

A BY-PRODUCT in the manufacture of zinc from ores obtained in northern New Jersey containing iron and manganese is used in the production of spiegeleisen.

THE best locality in the United States for making tests on the raw materials used in cement manufacture is at Allentown, Penn. The Lehigh Testing Laboratory is specially equipped to do such work well.

THE tantalum minerals are in demand on account of their containing the metal tantalum, which is used at the present time only in the manufacture of very fine wire for use in the construction of what is known as the tantalum lamp.

ELECTROLYTIC ZINC is made by Brunner, Mond & Co. Their product is real electrolytic zinc, being deposited by electrolysis from a zinc solution, and is a high grade of metal. Zinc is also made in Sweden and Norway by electro-thermic smelting by the De Laval process. Beer, Sondheimer & Co. are the agents in America.

THE approximate method given in the American Ephemeris & National Almanac for determining latitude from altitudes of Polaris at any hour-angle will give the latitude within a few tenths of a minute of arc. The maximum error will rarely exceed half a minute. The tables given in connection with this method are based on constant values of the right ascension and declination of Polaris and no account is taken of the change of apparent place of Polaris from day to day.

THE greatest demand for arsenic is from manufacturers of paris green, which is an aceto-arsenite of copper, worth 12c. per lb. at New York. It is used as a pigment, and its poisonous character, while restricting its employment for this purpose, makes it an admirable insecticide in agriculture. It has been often suggested that the silver-lead smelters and refiners who produce appreciable quantities of copper sulphate and can recover arsenic in roasting speiss, should undertake the manufacture of paris green.

FEW MINERALS are more universally distributed than the micas, but this wide distribution pertains only to the mineral in flakes and crystals too small to be of value. Both biotite and muscovite occur in igneous and metamorphic rocks, as well as in the sediments derived from the crystalline rocks. Phlogopite appears to be confined to the metamorphic rocks, and generally with relations indicating its igneous origin. Muscovite is the mica mined in the United States and India, while phlogopite is obtained from the Canadian mines.

THE most important manganese-ore-producing country is the Russian Empire, the major portion coming from the Caucasus district, where these ores occur as bedded deposits, lying almost horizontally near the tops of the lofty hills, at an altitude of 1,000 ft. above the Kvrilli river. The existing beds, as opened on seven mountains near the village of Chiaturi, are reported to have an average thickness of six to seven feet. The ore is chiefly pyrolusite, but other oxides of manganese also occur. It is claimed that an area of more than 22 square miles of the present surface is underlain by ore available for mining. In some localities the materials composing the bed, without sorting or cleaning, carry 50% of manganese, the average being probably 40 to 45 per cent.

LAND below the line of ordinary high tide is not 'public land.' If the tidal water forms a State boundary the land belongs to the State. If it bounds a Territory the land is reserved for the use of a future State. No location of a lode-claim can lawfully extend below the line of ordinary high tide. Under special congressional laws placer mining is permissible between the low and mean tides on the shores of Behring Sea under such regulations as may be prescribed by the Secretary of War. This is the only privilege sanctioned by the Federal Government, of carrying on mining operations below the line of ordinary high tide, of which we are aware.

THE 'law of the apex' embraces all deposits in place within boundaries that are definable. The definition of the word 'vein' as used in the United States mining laws is broad enough to include mineralized masses, veins of replacement and of impregnation, as well as fissure-veins. The existence of 'walls' is a non-essential. The commercial limit of mineralization is a boundary in the legal sense. The deposit described in the inquiry is a 'vein' within the meaning of the Federal mining laws. Its boundaries might be either the lime as a foot and shale as a hanging wall, or the lime as a foot-wall and the limit of commercial ore as the hanging. The law does not take into account the geological origin of the deposit. If in place, mineralized and lying within boundaries that may be ascertained, it is a vein.

THE decrease in the quantity of quicksilver produced in California is due rather to a lessened production of all the mines than to any serious falling off in the output of any single one, with the exception, perhaps, of the New Almaden property in Santa Clara county. This is the oldest quicksilver mine in the country, and for years was the largest producer on this continent. The place that it held in the production of quicksilver is best indicated by the fact that of the total output of the whole State of California during the last 55 years nearly 2,000,000 flasks, fully one-half, has been produced by the New Almaden. At present the New Idria mine in San Benito county is one of the largest producers in the State. The Napa Consolidated, in Napa county, and the New Almaden come next as regards output. The Oceanic, the Great Western, the Great Eastern, the Socrates, the Karl, and the Altoona have been the other principal producing mines of the State.

UPON application for patent the re-locator or his successors in title will not be permitted to include in his estimate of the value of improvements required by law to be made as a condition precedent to patent, any of the labor done or improvements made by the original locator. A voluntary grant from the original locator to one who has perfected a valid re-location is ineffective for this purpose. *A fortiori*, a grant from the purchaser at a sheriff's sale made prior to the re-location would be of no avail. Expenditures for patent purposes must have been made subsequent to the re-location by the re-locator or his grantees.

It is doubtful whether core-drilling can be considered as an expenditure applicable to patenting. This question has never been decided by the Land Department or the Courts. In our opinion this is not such an expenditure or improvement as will satisfy the law. It does not facilitate the extraction of ore. It may indicate where the ore is or is not, but possesses no other permanent value.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

On Knocking.

The Editor:

Sir—In the boom mining camps of Nevada, particularly, one is apt to see a card stuck up in some bank or office which is addressed to anyone who reads, giving him this homely advice:

"Do not be a knocker. Put up your little hammer. There is no end of fun in minding your own business, *et cetera.*"

This, translated, means that if you are not taken in, do not interfere with the good work of taking others in. In all these camps there are several good mines, perhaps as many more promising prospects, twice as many more on which work is suspended indefinitely, a number of prospects being worked with more or less vigor, but all of doubtful issue, and a thousand claims taken up for several miles in all directions, that legally could not be held, for no metal-bearing rock can be shown on any of them, though they all have the regulation 10-ft. hole sunk, even in 'drift,' solid rock not being encountered. In one camp they claim to have no failures, still there are a number of equipped shafts that are not working nor have they been for some time past. However, there is always some excuse. One, for instance, is shut down because the president of the company died.

There is a fixed equation for all mining successes, and it is:

A lode + pay ore = Results.

It is bad enough to have to prospect for pay-ore in a promising lode and "results" are often doubtful in the finest of veins, if there is no shoot of pay-ore. How much more doubtful must "results" be when the prospecting work is confined to hunting for a vein. Seeking "results" under the last conditions (sinking blindly in country rock and driving in search of a vein) is analogous to looking for that needle in the hay-stack. And still this is what is being done continually in the Nevada camps, and companies are formed to 'make' a mine on the conditions just outlined. Some of these companies do honest work, even if they are failures. Others do more or less work, the promoters holding the managing positions and drawing salaries. Others are swindles pure and simple, the only beneficiaries being the promoters.

When glowing accounts are given of what some other mines in the district are doing or have done, and stock is offered "for a limited time," of course, at 10 or 15c. per share, the investor of small means had better leave it alone.

One property I call to mind bases its claims to future greatness on the fact of being on a line drawn between two producers two miles apart. The attention of the public is always called to note the proximity of the property promoted to some producing mine; often, regardless of its location in regard to the same. Others will gloat over the fact that they are on the extension of some big mine, regardless of what the distance may be.

Few people take into account that a fissure seldom is continuous for a thousand feet, and that 400 ft. is a generous length, on the average, for a good ore-shoot. If getting into line with some known orebody a mile away will produce "results," regardless of the lack of vein or orebody, or even indications of it, can be taken as "convincing evidence that the work will develop a great producer," why stop there? Why not follow up the good thing on the same line right on around the world? One proposition is as sane (or, rather, insane) as the other.

Prospective buyers should be careful, and always submit prospectuses to some mining man, even if they have to pay him for the advice given. It will, as a rule, be the cheaper way in the long run. They should recognize the responsibility an engineer assumes in giving such an opinion, and he should be paid for it. I once tried to dissuade a man from spending money on some claims that offered no inducement at all, as far as I could see, for developing them. I noticed he did not take the advice in good part, and tried to sustain his action by saying he had found carbonate ore carrying 70% copper. When I remonstrated, saying there was no such copper content in carbonate ores, he replied: "I see you don't know as much about copper as you think you do." I guess he was right, as I took the reply to mean, mind your own business; and emphasized the slogan of his district: "Don't be a knocker."

Knocking is as essential to the true advancement of a camp as promiscuous booming; for a judicious amount of truth does no harm except to the man with the gold brick, and all right-minded men should be ready to squelch him, and his schemes, if necessary.

All of the camps referred to offer good opportunities, but many shady ones are offered on the strength of the few good. These are usually colored in the highest degree, and are to be shunned. The man with ordinary mining experience can easily size up the fakes, and those outside of the charmed circle should consult with men they know have the experience, before investing. This, as a rule, would be the safe way; but many like to take the 'flyer' on their own hook; and these, usually, are able to stand the loss. The majority, people of small means, invest hard earned savings with the hope of making something more, and it is a sad fact that these are usually fleeced. This class of people is the great mine that the promoter exploits, and it is no wonder that he tries to appeal to the false pride of those of us who represent capital and investors seeking legitimate business ventures, by the insidious threat (more than appeal), "Don't be a knocker;" meaning, if not taken in yourself, don't interfere with others biting.

Have investors no rights that can command respect? Because we who may represent large investors are not taken in, shall we stand passively by and see the small man 'done up,' just for fear we may be called 'knockers?' Certain kinds of knocking are to be frowned down. But if disclosing the nefarious schemes of unscrupulous promoters, for robbing the poor man and woman of their small savings, so that these latter may beware; or, if turning down the parasite who seeks you to introduce you to some property owner, and then demands a commission from you, in case a deal is made, is called knocking, then I say knock and knock hard, for moral and civic decency demand it.

Well directed exploratory work is to be commended, for mines are *made*, as a rule; but there must be a fighting chance. When one sees shafts sunk in barren country rock (lava, at that), and where this juts up through the overlying drift, because it is decomposed and stained with iron oxide, it is pointed to as "the mother lode," it is liable to bring on a tired feeling; and when one sees work prosecuted where the outcome is certain failure, and knows that many a poor man's *all* is being engulfed, it makes him weary indeed; but, when he sees other, supposed, work purely on paper, and the pictured results solely imaginary, then the tired feeling vanishes and the desire to knock is hard to resist. Then it is justifiable, and the harder it is done the better; for such promoting is done to mine the pocket of the investor. The

looking out for the investor's interests is *our* business, and "there is no end of fun minding your own business."

E. A. H. TAYS.

Phœnix, Arizona, March 27.

Slime Filters.

The Editor:

Sir—I have read with great interest the contributions to your columns regarding recent developments in slime filtering. The rivalry of the adherents of the two most prominent systems of vacuum-filtering should tend to improve the practice, but I have watched in vain for a comparison of the results attained here with those reported of the Ridgway filter at the Great Boulder mine.

The question at issue between the Butters-Cassel and Moore adherents seems to be as to whether it is more economical to install and operate a plant designed to transfer solutions to stationary filters or to transfer the filters (and charge) to and from the solution. As there seems to be little evidence to support the claims of superiority in the matter of attendance or speed of deposit and washing the cake, in the same slime, the discussion might be said to be narrowed to the comparative cost per ton-capacity of a plant of each type capable of conducting the remaining operations, transferring, and discharging, in a fixed time, with the question of comparative maintenance costs as a further determining factor. Are there not questions of more vital importance to the development of the art?

Judging from published reports on Moore and Butters-Cassel installations, it apears that 50 sq. ft. of filter-area per ton of slime (dry weight) treated in 24 hours is well below the average required. The Ridgway filter, with a total effective filter-area of 50 sq. ft., is reported to have a capacity of from 25 to 50 tons per 24 hours, varying with the character of the slime, or one to two square feet per ton of slime treated. This comparison is rather startling and suggests the necessity of a careful examination of the fundamental elements of the two plans of operation. No conceivable difference in slimes could account for such a wide divergence of results.

In the American practice a cake three-fourths to one inch thick is formed on perpendicular canvas filters. In the Ridgway machine a cake from three-sixteenths to three-eighths of an inch is formed and suspended on a horizontal filter-cloth. The vacuum applied is about the same, but while the cake is formed in 13 seconds in the Ridgway machine, from 30 to 60 minutes is required in the American plant. From the nature of the operation it is evident that the rate of accumulation of slime becomes slower as the thickness of the cake increases. The first one-eighth inch is deposited in a much shorter period than the last eighth. It is improbable that the American filters accumulate from three-sixteenths to three-eighths of an inch of cake in the first 13 seconds, but the long time required for transfers makes a thick cake a necessary evil.

The very rapid accumulation of the Ridgway filters must be due to elementary differences that would not appear of such importance. Is it the difference in the filtering medium or the position of the filter? It seems likely that filter-cloth is so much less easily clogged than canvas, that the main difference in results is accounted for by this structural difference alone.

The results of observations on the rate of accumulation of the progressive layers of the cake, the effect of position, horizontally suspended or vertical, the rates of accumulation on canvas and filter-cloth, and the durability of filter-cloth in horizontal and vertical positions, would be of great assistance in improving our practice. Progress in the direction of a compact automatic plant that can be installed and maintained cheaply. The last word has not been spoken in the field of vacuum-filtering.

J. R. BLAKE.

Searchlight, Nevada, April 8.

Pockets in Gold Veins.

The Editor:

Sir—In explanation of the occurrence of pockets in the upper portion of gold veins as presented by George W. Kimble in the issue of March 16, I offer a theory in opposition to that of secondary enrichment by descending solutions. It is as follows: The pockets are due to the precipitation of gold from the ascending metalliferous hot spring waters at the points of *sudden* dilution, cooling, and mechanical interference by descending surface waters.

This theory is based on the occurrence in Nova Scotia of rich gold-bearing quartz at the intersection of small lateral, locally termed 'angular,' veins with the main quartz body, and is consistent with the facts as observed by Mr. Kimble at Thompson's mountain, in Eldorado county, California.

The term 'ascending hot spring waters,' borrowed from W. H. Weed, is preferred to 'magmatic waters,' or 'waters ascending from the depths.' 'Magmatic waters' seems to exclude the ore-bearing solution arising from sedimentary rocks, while 'waters ascending from the depths' is a term suggesting the 'barysphere.' Mr. Kimble seems inclined to believe in a descending gold solution, from which the metal is precipitated through the agency of pyrite or the products of its oxidation, while I take the view that the gold and associated iron bodies described were simultaneously present in ascending solutions, but were precipitated at different points. The nature, or chemical composition of ascending metalliferous hot spring waters has never been satisfactorily explained. I have a working theory on the subject, but like Thomas Lawson with his remedy, it will be produced later.

In Nova Scotia, gold occurs in addition to the instances mentioned, in the locally named 'rolls' and 'barrels,' which have been frequently described. In these cases the gold appears to have been precipitated by a shattered condition of one or both vein-walls producing a mechanical interference with the ascending solution at various points, as well as offering a greater cooling surface. Secondary enrichment in some cases offers a problem similar to that of 'the apple within the dumpling.'

RICHARD C. HARRISON.

Stillwater, Nevada, April 7.

Assay of Cyanide Solutions.

The Editor:

Sir—I have noticed in the PRESS of March 5, Mr. Gendar's scheme for the assay of cyanide solutions.

I would call the attention of those interested to the following well-known method, which, for rapid work and accurate results, will, I think, be found to compare favorably with any.

Measure, according to grade of solution, a convenient quantity of KCy (working solution), add concentrated sulphuric acid to excess; let stand two minutes; then add from ½ to 1 gram of cement copper and boil until the solution takes on a blue or greenish-blue color, pour onto filter-paper in funnel, wash twice with boiling water; dry the filter-paper containing the precipitate in air bath or otherwise; flux filter-paper and precipitate in assay-crucible, or, scorify, cupel, part, and weigh.

DOUGLAS MUIR.

Guanajuato, Mexico, April 8.

The Great Gold Mines.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

It is always interesting to be told what are the biggest things of their kind and those who operate mines will be glad to know to what heights of productiveness their properties may attain, if all goes well. In sifting the data available concerning the leading gold mines of the world, we find sixteen that are worthy of being placed in one group, representing the great bonanzas of the present day. The selection of these leaves room for discussion. It is our opinion that a great mine must not only make a big output but must make it regularly and with a prospect of continuance. Stability is essential to greatness, for the less a mine is a mere incident in gambling and the more it approximates the ideal of an industrial undertaking the greater it is—at least, from the standpoint taken for this tabulation. Another group of notable mines will be described in a later article, and among them will be several famous properties that may be deemed by some to belong to the first class.

THE GREAT GOLD MINES.

NAME OF MINE.	Monthly output. Tons.	Monthly output. Value.	Profit.	Value per ton.	Cost per ton.	Profit per ton.
1. Simmer & Jack, Transvaal	62,300	$508,008*	$224,055	$8.15	$4.55	$3.60
	62,140	503,066	228,328	8.09	4.42	3.67
2. Robinson "	30,327	427,852	278,931	14.10	4.90	9.20
	31,912	449,973	293,269	14.10	4.91	9.19
3. Robinson Deep "	39,039	416,993	219,778	10.68	5.05	5.63
	38,649	412,996	198,554	10.69	5.56	5.13
4. Cason "	36,200	373,091	173,863	10.31	5.51	4.80
	36,600	377,213	175,284	10.31	5.52	4.79
5. Village Main Reef "	38,000	327,064	126,677	8.61	5.28	3.33
	36,190	303,888	112,432	8.39	5.28	3.11
6. Esperanza, Mexico	16,463	607,948	378,437	36.93	13.94	22.99
	16,936	495,125	270,939	29.24	13.25	15.99
7. Homestake, South Dakota	120,405	463,800	134,500*	3.85	2.73	1.12
	120,110	465,000	136,000*	3.86	2.73	1.13
8. Camp Bird, Colorado	6,676	271,568	215,904	40.68	8.34	32.34
	6,901	268,559	206,135	38.92	9.05	29.87
9. Champion Reef, India	15,336	234,059	117,000*	15.26	7.63	7.63
	15,219	233,395	116,500*	15.34	7.69	7.65
10. Mysore "	16,550	387,851	193,900*	23.43	11.72	11.71
	16,300	355,751	177,850*	21.82	10.91	10.91
11. Waihi, New Zealand	27,465	303,644	150,350*	11.06	5.58	5.48
	26,888	305,210	152,775*	11.35	5.67	5.68
12. Mt. Morgan, Queensland	24,781	372,760	140,500*	15.04	9.37	5.67
	27,769	435,380	155,000*	15.68	10.10	5.58
13. Oroya-Brownhill, Western Australia	11,010	237,751	158,988	21.59	7.15	14.44
	10,740	240,676	174,886	22.41	6.12	16.29
14. Great Boulder " "	12,445	223,638	122,026	17.97	8.17	9.80
	13,653	228,445	135,780	16.73	6.79	9.94
15. Golden Horseshoe " "	22,609	249,605	120,057	11.04	5.73	5.31
	20,165	249,411	122,360	12.37	6.30	6.07
16. Ivanhoe " "	18,186	209,253	102,378	11.51	5.88	5.63
	19,094	213,104	102,359	11.16	5.80	5.36

The figures given represent the output for two consecutive months, either November or December, 1906, or December, 1906, and January, 1907. It is not practicable to quote later months, because it takes time to collect, and then to sift, the data. By giving the figures for two months, instead of one only, it is possible to note a variation, which in some cases is a characteristic feature. The best mines are the most regular, the regularity in many instances being secured by the use of a reserve of gold, the amount of which is now made public both in Western Australia and on the Rand. In one or two cases the profit for the month is estimated from the total profit officially given for a period of six months or a year. Wherever the figures are estimated they are marked with a star. In bringing everything to a uniform basis, the pound sterling is taken at $4.85 and the ounce of fine gold at $20.67.

Among the sixteen, five mines belong to the Rand. This is a fair proportion, having regard to the leading position of the Transvaal as a gold-producing country. The Simmer & Jack has 360 stamps, of which 320 are maintained in operation; this mine is estimated to have 11,000,000 tons of ore available; the Robinson has 210 stamps and its reserves are expected to last twelve years; the Robinson Deep supplies 300 stamps and has 10,500,000 tons of ore blocked out; the Village Main Reef has 220 stamps, as also the Cason. The monthly production of these big mines on the Rand is so regular that the yearly output is fairly indicated. Next on the list comes the Esperanza, one of the lucky purchases of the Guggenheims, who control it. This mine is at El Oro, in the State of Mexico, about 90 miles from the City of Mexico. During 1906 the Esperanza produced 159,047 tons, yielding $4,548,975, out of which $3,420,462 was paid in dividends. But the reserves are only estimated at $1,500,000, although cash on hand and ore in transit make a sum of $3,709,226. Operations have been crippled for several months by shortage of railroad cars, for most of the ore goes to the smelters. The total production of the Esperanza has been 32,500,000 *pesos*, say $16,000,000. Of the Homestake mine it can be said that it has been the pride of American mining men for twenty years on account of the small cost of operating and the big profit won from low-grade ore. Monthly statements are not made, so that those we give are estimated from the official report for the second half of 1906, which states that 720,216 tons were crushed for a yield of $2,791,215 and a profit of $797,534. Another American mine is the Camp Bird, near Ouray, in Colorado. The contrast is vivid, for the Camp Bird is a high-grade mine with high costs and small reserves, as compared to the Homestake. At the present time the Camp Bird

mills are treating ore above the average of the mine, it being the policy of the management to make large profits in compensation for a period of unproductiveness due to the destruction of the mill, by snowslide and fire, a year ago. Ordinarily the Camp Bird makes a monthly profit of $100,000 to $125,000, and the ore averages $25 to $30 per ton. In the four years ending September 30, 1906, this mine yielded $8,152,000, of which £676,000, or 82½% on the capital, was distributed in dividends. As there was a balance of £115,000 on hand, making 12½% more, the total profit since 1902 was £791,000 or nearly four million dollars, equivalent to 95% of the capital of the company. The mine carries a large tonnage of broken ore in the stopes, which is valued at $2,600,000 and is held in reserve. The total reserves are estimated at $4,500,000.

Two Indian mines come next. In India there are eight gold mines of importance and all of them are in the Kolar district of Mysore. The three leaders are the Mysore, Champion Reef, and Ooregum, which yield an average of 18,000, 11,200, and 5,500 ounces of gold monthly. In the year ending September 30, 1906, the Champion Reef produced 203,174 tons yielding 177,641 oz., worth £678,706. From this a profit of £347,609 was made, that is, $1,685,903. During the past year the 210 stamps of the Mysore mine treated 185,900 tons of ore, yielding 205,918 oz., worth £809,413, giving a profit of £460,014, equivalent to $2,231,068. The reserves of ore amount to 747,000 tons, equivalent to four years' supply. The deepest workings are at 3,500 ft., on the dip of the vein. The dividends to date are $23,402,300 on a capital of $1,479,250 or £305,000.

Four great mines are credited to Western Australia; all of them are at Kalgoorlie. The famous Lake View Consols is not included, for it has lost its premier position, although in 1899 it was the largest producing gold mine in the world, yielding 33,160 oz. in the month of May and 199,230 oz. valued at $3,897,479 during that year. The Oroya-Brownhill is the most profitable of the four quoted, but its future is uncertain; in fact, most of the big Kalgoorlie mines have passed their zenith, the lowest levels being less rich than the upper ground. The Great Boulder has 453,000 tons in reserve and is 2,000 ft. deep. The profit last year was £320,258, or $1,553,251. The Oroya-Brownhill paid dividends amounting to £360,000 and the Ivanhoe paid £340,000 in 1906.

In Australasia, outside of Western Australia, there are two truly great gold mines, namely, the Mt. Morgan and the Waihi. The Mt. Morgan, in Queensland, reached its maximum output long ago, in the year ending November 30, 1889, when it produced 75,415 tons, yielding 323,543 oz., worth £1,331,485, while the expenditure was £227,770, permitting the payment of £1,100,000 or $5,335,000 in dividends. The yield per ton was 4 oz. 6 dwt. 4 gr., while the cost represented only 17% of the value of the ore mined in that year. That was a great record. For the half-year ending November 30, 1906, the total revenue was $2,173,482, the resulting profit being $841,260. During the six months the chlorination works yielded 51,878 ounces of gold and 20,838 oz. additional were extracted from the blister copper. Of copper, there were 1,751 tons of blister and 172 tons of precipitate. These metallic products were the yield from 152,678 tons of ore. Thus it is evident that the Mt. Morgan is equally a gold and a copper mine. The output for 1906 was worth $3,778,926. The total production to the end of 1906 has been $2,966,032 tons of ore, yielding 3,079,695 ounces of gold, worth $60,964,087, the total dividends being $32,757,705.

The Waihi is still a young mine, with promise of growth. It is barely 1,000 ft. deep and is credited with reserves of a million tons of ore. Up to the end of 1905 the production had been $21,891,450, giving $9,920,505 in profit. In 1905 the output was 298,531 tons, yielding $3,533,326, and a profit of $1,679,206. In 1906 the Waihi produced 328,860 tons of ore, yielding gold worth $4,001,250. Up to March 1, 1907, the output has been $26,555,690 and the dividends $11,775,290.

The column giving the value of the ore per ton affords some suggestive variations; it is seen that the richest ore is that of the Esperanza and Camp Bird, and this maximum richness happens to be associated with instability, as an experienced miner would expect, for in both cases the present output is above the average of the mine. Only two other mines, the Mysore and the Oroya-Brownhill, yield ore containing more than an ounce of gold per ton. The poorest ore produced by any really great mine is that of the Homestake, which is the only member of the group that yields an average of less than a quarter of an ounce of gold per ton. Next in lowness of tenor come the Simmer & Jack and Village Main Reef mines, the only ones, except the Homestake, that average less than half an ounce. In regard to the cost, or total expense of mining, hoisting, and then extracting and marketing the precious metals (for there is usually a little silver) in the ore, the figures reflect the relative richness of the material handled, the lowest cost being incurred in connection with the poorest ore, while the highest expenditure characterizes the handling of the richest, as is shown, respectively, by the Homestake and the Esperanza. But low costs are due, in part, to large bodies of ore and the ability therefore to treat an enormous tonnage with a relatively small fixed expenditure. At the same time a low-grade ore is a spur to economical management, which is born of the necessity that is the mother of both invention and resource. However, as the cost of mining is usually at least two-thirds of the total expenditure and as the character of the mining is dependent upon the nature of the lode, it is necessary to refer in detail to this factor.

On the Rand each mine has two, three, and even four seams of hard goldbearing conglomerate, separated by quartzite. The valuable portion occurs in bands from six inches to four or five feet wide, within a width of country varying from 15 to 30 ft., and, to generalize, it may be stated that the average stoping width of ore is from five to seven feet. The dip is flat, to the point of being a drawback. In the Esperanza and Camp Bird the lodes are steeply inclined and about five feet wide, though in both the heart of an orebody will be fully 20 ft. across. The Indian mining companies are working veins from two to seven feet wide, with an average of four feet of quartz, traversing schist. At Kalgoorlie the gold occurs as a tellnride and the stoping width averages six feet of quartz and calcite in chloritic schist. The Kalgoorlie lodes are stoped from two or three feet to 20 or 30 ft., the maximum being in the middle of a lens. In the Lake View Consols the great orebody was 30 ft. wide for a length of 1,000 ft. In the Oroya the stopes average seven feet and the bonanza ore is sometimes 60 ft. wide. The Waihi, Mt. Morgan, and Homestake mines include irregular occurences of ore; the first of these may be described as a lode 100 ft. wide divided by horses of ground, requiring separate stopes; the Mt. Morgan is a highly altered mass of graywacke without definite shape; it is a hill of ore; at 750 ft. below the outcrop the deposit of gold-copper ore covers an area of 1½ acres; the Homestake has an orebody of quartzified schist 400 ft. wide, portions of which are left standing, as much for safety as for economy.

One fact is clear, namely, that in all these great mines the ore is a full stoping width, the economic unit of min-

ing; in none of them is the average less than four feet and in most of them it is five feet or more.

On the whole, we venture to say that the ideal mine is one that has a lode five feet wide, of ore yielding $10 per ton, that can be extracted at a cost of $5 per ton, with reserves of, say, one million tons. And this leads to the question: Which is the greatest gold mine in existence? We hesitate to answer categorically, but we point to three mines any one of which may well be considered first. Those three are the Robinson, the Waihi, and the Homestake. The Robinson has reserves sufficient for a dozen years, that is, 4,500,000 tons of ore. The yield is $14 and the cost is less than $5, so that there is a handsome margin of profit. Only 18% of waste is sorted from the ore as it is broken and the 240 stamps crush at the rate of 5.3 tons per head. The stoping width is 6½ ft. The profits are $3,500,000 per annum. The dividends to date are $25,497,362 on a capital of $13,337,500. The Waihi is a lode averaging 30 ft. of ore in andesite; the best of it has been extracted only to 800 ft., for a length of 2,000 ft., while the shaft is now 1,000 ft. deep. The ore contains a large proportion of silver, but it is readily cyanided. The reserves are estimated at a million tons, but this does not exhaust possibilities or even probabilities; for the property includes a large area as yet not explored in depth. The Robinson, like all South African mines, has a definite end in sight, for the flatly dipping 'reefs' pass into a neighbor's territory and its resources therefore, although tremendous, are limited by known lines. The Waihi and the Homestake can be deepened indefinitely in pursuit of the ore without facing an assured finality. In regard to the Homestake, the reserves are not accurately known, but they are estimated to be sufficient for at least twenty years, that is, over 30,000,000 tons. Dividends to date aggregate $22,134,840. The mine has been worked to about 1,000 ft. and the workings are down to 1,400 ft. But the ore is poor, and despite the exemplary economy exhibited in the operations of this great mine, the margin of profit is so small as to be a factor of danger. So the choice is between the Robinson and the Waihi, and this brings out one of the distinctive features of mining on the Witwatersrand, at least as regards the proved mines that started on the outcrop of the Main Reef series. Most of them have 'deep-level' mines beyond them, that is, where the lode dips out of their territory it is being worked through the deeper vertical shaft of a neighbor in such a way as to afford absolutely reliable evidence as to the richness and width of the ore at the future bottom of the workings of the outcrop mine; in other words, the mass of ore in the outcrop mine has been carefully sampled on a working scale by the operations of the 'deep-level' mine. In this way the width and gold contents of the bottom of the Robinson mine are known, the possibilities of greater richness in depth are absent, but so also are the chances of sudden impoverishment. On the other hand, the Waihi has reserves much smaller, not a quarter those of the Robinson, because it is being developed in the ordinary way, without a deep-level property ahead of it on the dip. Such a mine has chances of striking much richer and even bigger orebodies, but it is also exposed to the risk of disappointments in depth—the pinching of the lode or its sudden impoverishment. For both of these are among the chances of mining. Thus, the Robinson is more nearly an investment, while the Waihi is a most attractive speculation. You choose between the assured prosperity that has a certain and inevitable end in plain sight and the splendid profitableness of a mine having much smaller reserves but the usual uncertainty as to its final performance. As all experience proves that persistence in depth is hazardous and as the bottom of the Robinson's ore measures are known and those of the Waihi are unknown, the choice is between the assured and the possible, where both are sumptuous. We accept the responsibility and label the Robinson as the greatest gold mine in the world, the greatest gold mine ever worked by man.

A Compound Assay-Furnace.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. FLECK.

The improvements of the portable gasoline assay-furnace have caused it to be introduced widely under varying conditions and often the volume of work soon outgrows the capacity and size of the portable furnace. In many cases the assayer does not like to discard it for the larger coke furnace, on account of the costs of fuel, expense of building, dust, and slow heating.

At Fort Bidwell, in California, conditions were all favorable for a compound furnace, two-stage, one using gasoline and the other wood, described herewith:

Gasoline costs 55 cents per gallon, and coke and charcoal are out of the question as the nearest railroad is 100 miles. In our first operations in this locality the gasoline furnace proved to be the best and cheapest; the question was to increase the capacity. This was done three-fold by setting up a large standard charcoal-furnace close beside the small gasoline and firing it with dry wood. The crucibles are charged and placed first in the wood-furnace, where they are annealed and dried and slow fusion begins, thus allowing all gases and traces of moisture to escape. Each crucible is transferred quickly to the small gasoline-furnace which is kept up to a high melting and cupelling heat; quiet fusion begins instantly and in ten minutes the crucibles are usually ready to pour.

With this equipment it is possible to melt and cupel in a single-crucible combination No. 5 Hoskins furnace, 16 assays in four hours, or 50 assays in a No. 6 four-crucible furnace in the same time.

In doing this rapid work, the flux is all first dried in open pans at a temperature of 200° F. before the charge of ore is added. The ore is now intimately ground and mixed with the flux in a small wedgewood, or glass mortar, by using the pestle in one hand for grinding and a small spatula in the other for mixing at the same time. The charge is then placed in the crucible and is ready for the wood furnace. This insures a quick, quiet fusion and the production of a clean homogeneous transparent slag, and the crucible is only slightly attacked on account of the perfect mixture coming in contact with the crucible for a very short time. No excess of flux is used, so the charge is concentrated to the limit of good work.

The old practice of rolling a charge of ore with the flux on a sheet of rubber and pouring lump and fine containing about 3 or 4% water into a crucible, then instantly placing a crucible in a hot furnace is the one most books describe, or in other words, this is about what the obedient student will do. This plan will answer when a large coke-furnace is slowly heated for the first melt, and a large excess of flux and covers are used. It is a well-known fact in chemistry, but not generally known to assayers, that if a sample of gold-quartz is roasted with salt in a muffle, about 50% of the gold will sublime and and escape and is lost as a volatile chloride. This is one of the many reasons why it is best to dry the flux in a large open pan just below the fusing point before mixing with the ore.

This simple elimination of moisture and gases is superior to all the nailed salt covers or any cover or extra blind. Every particle of the finely ground ore should be surrounded with the exact proportions of the fluxing material, all objectionable parts being removed that it is possible to remove before the operation is begun.

The Hercules Mill.

Written for the MINING AND SCIENTIFIC PRESS
By SCOTT TURNER.

The Hercules mill, near Burke, Idaho, is the most recent of the concentrating plants in the Cœur d'Alene region, and is therefore interesting as typifying the most approved lead-silver milling methods in northern Idaho. The mill was first put in operation about twelve months ago, but many changes have been made since that time.

In the original equipment, iron jigs, made by the Hodge Iron Co., of Hancock, Michigan, were installed, but proved unsatisfactory, and were taken out, home-made Harz jigs being substituted. The difficulty with the Hodge jigs was that the screens did not work uniformly, being lively on the outside and dead nearest the plunger, thus making a poor product, and limiting the capacity of the machine. The wooden jigs are working satisfactorily, the equipment consisting of six two-screen, and six three-screen jigs, all screens being two by three feet in area. One of the two-screen jigs is not used at present, being held in reserve, but will probably be used to treat 12 mm. material.

As originally operated, there were no trommels in the mill, all screening being done by impact screens, which, however, proved unsuited for the work, and followed the iron jigs down the hill, a series of trommels taking their place. The principal objection to the impact screens was that they became clogged with wood-pulp. A third departure from regular Cœur d'Alene practice was the installation of large unwatering wheels, for the middling and tailing, which proved troublesome and wasteful of power, and were supplanted by home-made shaking screens.

In fact, every departure from generally accepted practice resulted in failure, with the exception of the Humphrey type of rolls for coarse crushing and re-grinding coarse middling, and the possible exception of the high-speed, narrow-face centrifugal rolls for re-grinding the finer jig middling. The Humphrey rolls have proved satisfactory here, as well as in the new Success mill, where two sets are used for re-grinding, and will probably become a popular type in the region, but the Sturtevant rolls are rather troublesome, due, probably, to the fact that too much is expected of them, as they are running, while set up close, on a feed ranging in size from 20 to 3 mm. and finer, which is too wide a variation for economic work. An easy improvement could be made by running the middling from the third-screen cups of the 20-mm. jigs, back to the Humphrey rolls, for re-grinding with the bull-jig middling. The lateral-adjusting device seems to be the weak part of these Sturtevant rolls.

One marked improvement in the design of this mill is the use of a multiple-unit electric-power system, making it possible, with the well-arranged system of storage-bins, to close down any unit without affecting the remainder, although, of course, the vanners and tables must run if the jigs and Huntington are working.

There is a complete system of electric bells and a code of signals, making it possible to signal the motor-room from any part of the mill. Wires are in place for a system by which it will be possible to stop any motor directly, by pushing a button upon any floor in the mill, thus throwing out the switch at the motor, but this arrangement has never been used.

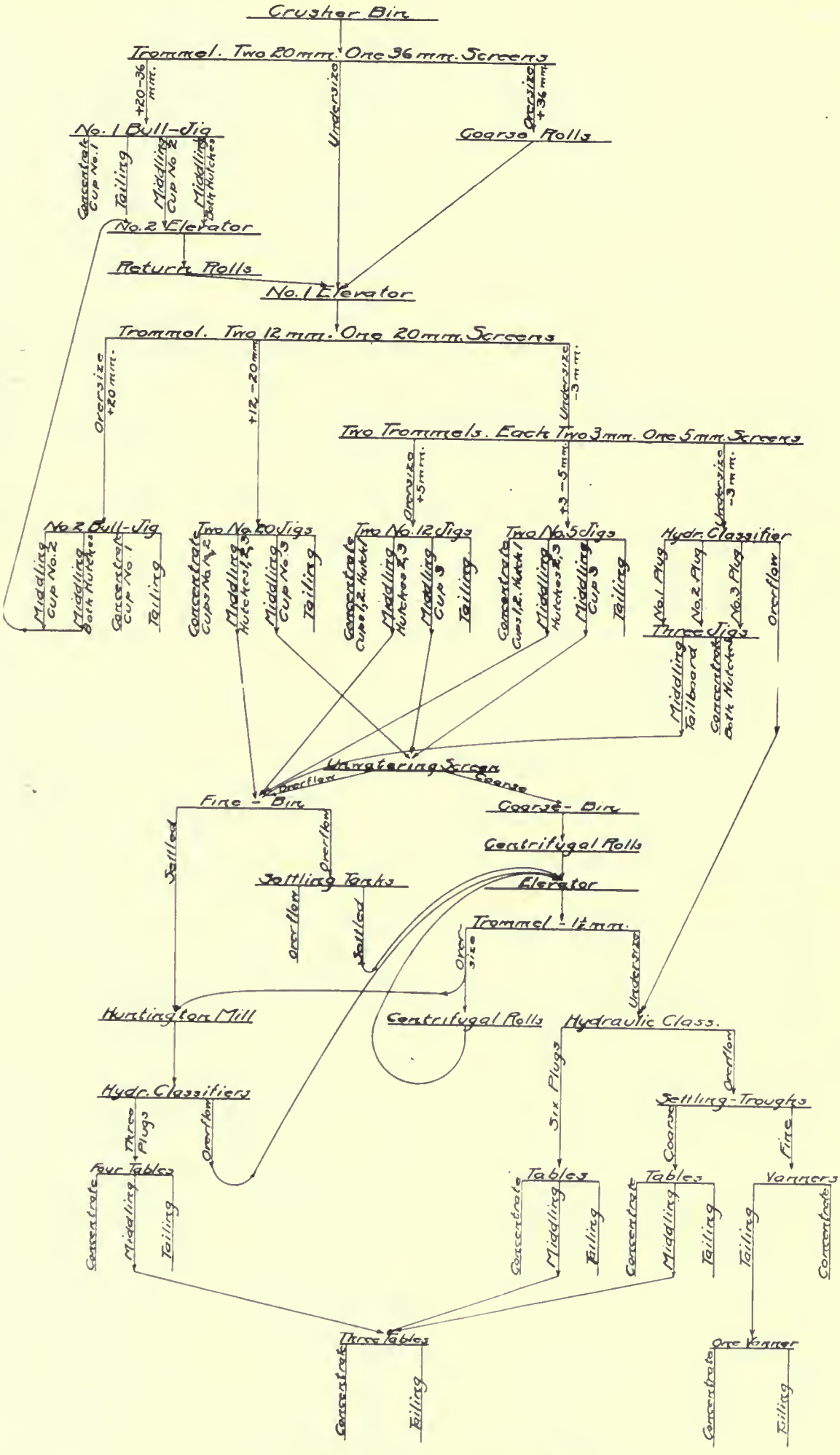
The treatment at the Hercules mill, briefly outlined, consists in preliminary breaking in a Blake crusher, screening, crushing oversize, treatment of screened and classified product on jigs of the Harz type, with subsequent re-grinding of coarse middling from the two bull-jigs in Humphrey rolls and the fine middling in Sturtevant centrifugal rolls, and final grinding in a six-foot Huntington mill. Below the Huntington mill are arranged the Wilfley No. 5 tables, and six-foot Frue vanners, which are fed from classifier and settling-tank plugs. The Wilfley middling is worked over again on a second set of Wilfleys, and the vanner tailing is thickened and treated again on a vanner. Fifteen Wilfley No. 5 tables are used for the first treatment, and five 6-ft. vanners, while three tables treat the Wilfley middling, and one vanner, the vanner tailing.

The mill is built on a steep hillside and but few elevators are necessary, there being an abundance of head-room everywhere in the building, as the total elevation from the track over the upper bin to the lower pump-floor is about 125 feet.

The mill-feed comes from the ore-bins at the mine by an electrically operated surface tram, to a point about 800 ft. above the mill, where it is stored and loaded into three-ton cars on an inclined tram, operating in balance, by which the ore is lowered to the mill, and dumped into the storage-bin, of about 200 tons capacity. The ore is drawn from this bin by a shaking grizzly above the Blake crusher, the fine material dropping through the two-inch holes in the feeder-screen, and the oversize going into the crusher, which is a 12 by 15-in. size; this material is then stored in a bin of about 50 tons capacity. The mill-feed is drawn from this lower bin by a shaking feeder, which is followed by the feed trommel, 9 ft. long and 4 ft. diam., with three screens—two of 20 mm. and one of 36-mm. size. The material finer than 20 mm. goes to the boot of the main elevator, the +20 −36 goes to No. 1 bull-jig, and the oversize to the coarse rolls. The material from the coarse rolls passes to the main elevator, and, together with the re-ground middling of the two bull-jigs and the undersize from the 20-mm. screens of the feed trommel, goes to the main trommel line, which consists of three trommels. The first is 9 ft. long by 4 ft. diam., with one 20-mm. and two 12-mm. screens. The −12 material goes to two small duplicate trommels, the +12 −20 to the pair of No. 20 jigs, and the oversize (+20) to the No. 2 bull-jig. The two smaller trommels are each 7½ ft. long and 3 ft. diam., and are equipped, each with two 3-mm. and one 5-mm. screens. The −3 mm. material goes to the hydraulic classifier of three plugs, the +3 −5 to the No. 5 jigs, and the oversize, + 5 mm. to the No. 12 jigs. Each of the three classifier plugs feeds a two-screen jig, the overflow passing below to the Wilfley-feed classifiers and settling-tanks.

Two storage bins are provided for jig-middling. One bin receives middling from the cup on the third screen of the No. 20, 12, and 5 jigs, after the material has been unwatered. The second bin, for the finer material, gets the hutch-middling product from the 20, 12, and 5-mm. jigs, the material passing over the tail-board of the three classifier-jigs, and the fine material carried by the water in unwatering the coarse middling. This bin overflows into a series of flat settling-tanks, from which the settled material is periodically drawn through plugs in the bottom and run into the elevator leading to the baby-trommel. The overflow from the settling-tank is either pumped back to the jig-floor, or run into the tailrace.

The coarse middling is drawn through gates, from the bin, into the centrifugal rolls by Sturtevant feeders, elevated, and screened in a trommel with a 1¼-mm. screen, and the oversize can either be fed to the second set of rolls, or sent to the Huntington mill, while the undersize goes to the tables. The material from the fine-bin is drawn through plugs direct into the Huntington, and then is classified and goes to the tables. This arrangement often causes trouble, as when a screen breaks on the coarse jigs, coarse material gets into the hutches, passes into



Flow-Sheet of the Hercules Mill.

the fine-bin, and stops the small plugs through which the feed is drawn. This also occurs when the unwatering screens wear through.

On the table-floor the arrangement includes a double row of tables and vanners, there being 15 No. 5 Wilfleys and five 6-ft. Frue vanners. These machines get their feed from various classifier plugs and from plugs in the bottoms of two long double rows of V-shaped settling-tanks, which extend the entire length of the floor, making a settling-tank length of over 500 ft. The tables make three products, namely, concentrate, middling, and tailing. The middling passes to a lower floor where it is treated on three tables, each making concentrate and tailing. The vanners make concentrate and tailing, and the tailing is thickened in a settling-tank below, and drawn through plugs to a vanner that works it over again.

The accompanying table shows the monthly averages, for three months, of the mill-feed, and the tailings and concentrates from the different machines. These results are from roughly-taken hand-samples collected every hour, and while this method is open to criticism and is necessarily inaccurate, still the monthly averages are fairly representative. It seems a pity that some automatic sampling devices are not installed, as there is an abundance of head-room, and they could easily be added at various points. These assay-returns would be more instructive if accompanied by a statement of the approximate weight of each product. The only weighing that is done is on the balanced tramway, where the cars are stopped and carefully weighed on an inclined scale, but no moisture-sample is taken, although there is much variation in the water-content of the ore. The concentrate is weighed when loaded into the ore-wagons from the storage-bins below the mill. The mill is treating approximately 250 tons per 24 hours, and is shipping nearly 40 tons of concentrate per day, averaging between 50 and 60% lead and 50 oz. silver, making a gross output of about $125 per hour, or $2 per minute. The tailing runs by gravity to the dump, while the concentrate-launders lead to storage-bins below the mill, where the material is unwatered and the water pumped back to the jig-floor. From the bins, the concentrate is loaded into wagons and hauled to the railroad, a distance of about one mile, down a steep grade.

	Silver Oz. per Ton			Lead Per Cent			Zinc Per Cent			Iron Per Cent		
	Sept	Oct	Nov	Sept	Oct	Nov	Sept	Oct	Nov	Sept	Oct	Nov
Mill Feed	7.20	6.55	6.11	7.69	6.55	6.32	3.01	2.32	2.67	8.50	8.03	8.47
Coarse Jig Concentrate	50.44	51.44	52.33	60.15	60.14	63.54						
Coarse Jig Tailing	1.28	1.43	1.21	0.76	0.70	0.57						
No. 1 Wilfley Concentrate	32.45	34.05	32.48	46.37	48.72	47.46	6.71	6.77	7.70			
No. 2 Wilfley Concentrate	27.12	32.86	29.76	35.78	45.62	40.40	9.73	6.61	8.81	21.04	18.07	13.14
No. 1 Vanner Concentrate	25.74	39.40	36.25	34.13	55.20	53.69						
No 2 Vanner Concentrate		34.26	22.22		32.50	20.00						
General Fine Tailing	3.00	3.80	3.60	1.73	1.74	1.93	2.92	2.69	3.20			
General Fine Concentrate	33.10	37.32	35.59	47.70	48.93	52.48						

During August, 1906, the coarse-jig, Wilfley, vanner, and fine concentrates ran lower and the tailings much higher. This leads to an interesting fact. Up to August 1, the mill had been running with two shifts of 12 hours each, the mill-crew being made up of experienced men. Shift-bosses were getting $5 per day, and all millmen $4. On the first of August the eight-hour system was adopted, and the men were cut to $3.50 and the shift-bosses to $4.50 per day, and the result was that the crew walked out, and the places were filled by green men, many of whom had never been inside a mill before. During this month the concentrates ran lower and the efficiency of the mill was a good deal less, to say nothing of the extra wear and tear on the machinery from improper care and handling. Assuming that the mill-feed was of the same grade, and that the same weight of concentrate was made per ton of ore treated, as before, and that the lower assays resulted from lead and silver going down the creek, and not from making a bulkier concentrate of lower grade, which standpoint is sustained by the fact that the tailing ran higher, it is plain that the mill would have lost daily about four tons of lead and 250 oz. silver, a loss of about $600 per day, or $18,000 for the month. How much did the company gain by the cut in wages? It is a common saying that it costs a company $1,000 to break in a new jig-man, and these figures seem to bear out this idea, as about a dozen new jig-men were tried during the month. These deductions are only intended to be general and their accuracy is vitiated in this case by the fact that the water supply was especially low during this month, and the new wooden jigs were just being started. By the end of the month, either good millmen had been secured, or the new ones had become experienced enough to begin to understand their business, and the results improved.

At this mill the jig-men are encouraged to make a concentrate running between 60 and 65% lead. As the jig middling is not sampled, the result is that they run the concentrate-gates high, and the middling-gates low, making a clean concentrate at the expense of running much first-class into the middling. At the same time, in order to keep the tailing low, they must make much middling. In this way both rich and poor material are run into the middling, making a bulky middling-product and causing high losses in the slime, when reground. A better plan would be to demand that the jig-men make a concentrate running about 55 or 60% lead, and sample the middling as well as the concentrate and tailing. Then the jigs could be regulated intelligently.

A cable-tramway is being installed to carry the concentrate, coarse tailing, and crude ore from the mine, down to the storage-bins at the railroad, where they will be loaded direct into the cars, the ore and concentrate going to the Selby smelter, and the coarse tailing being used as road-metal. By this method, the water supply, which has always been inadequate, will be increased, as the coarse tailing will be unwatered and a centrifugal pump will elevate this water to the jig-floor.

The mill is run by six three-phase induction motors, starting on 110 and running on 220 volts, the power coming on a 60,000-volt line from Spokane, a distance of about 100 miles. There are six motors—one for the crusher, of 15 h.p.; one of 25 h.p., which runs the jigs, small trommels, middling elevator, shaking screens, small pump, etc.; one of 50 h.p., which runs the two sets of coarse rolls, two big trommels, main elevator, shaking feeder, etc.; a 50-h.p. motor for the two sets of centrifugal rolls, the Huntington mill, and baby trommel; and a 40-h.p. motor, which runs the elevator, and all the tables, vanners, and machine-shop machinery; a sixth motor of 15 h.p. runs the Smith-Vail pump on the lower floor.

Daily readings of the watt-meter for one month, all shut-down time being deducted, when the mill was handling about 250 tons per 24 hours, showed an average consumption of about 106 kw.hr. per hour, or 142 horsepower hours, a consumption of about 14.2 h.p. per ton of ore. The current passing through this watt-meter ran all the mill machinery, as well as the crusher for first-class ore, all mill-lights, sample-dryers, pumps, and the machine-shop.

The mill is run with three shifts of eight hours each. The regular mill crew consists of one crusher feeder, one jig-man, one Huntington-man, one vanner man, and a shift-boss. The millmen all get $3.50, and the shift-bosses $4.50 per day. Besides this regular crew, which changes shift every two weeks, there is a permanent day-crew, consisting of a repair-man and helper, a machinist and helper, one or two roustabouts, a mill-carpenter, and a general foreman. The mill is heated by steam from a wood-burning boiler.

Beginniug with January of this year, experiments were made in saving the zinc. A concentrate was made on the second screens of the No. 20, 12, and 5 jigs, which ran about 30% zinc and 12% lead, for which product the company found a market. To make a product so free of lead, it was necessary to run the first-screen gate low, which meant a lower-grade lead concentrate, and the scheme was abandoned. Another change that is being made is the installation of two 80-mesh Callow screens, to size the fine product on the Huntington-floor. There is an increasing tendency throughout the region toward using sizers rather than classifiers for fine material destined for table or vanner-treatment.

The general question might be raised as to the advisability of equipping a concentrating plant of this size with a single 6-ft. Huntington mill for fine grinding, instead of two 5-ft. mills. The excellent arrangement of storage-bins in the Hercules mill makes this point of less importance there, but even there the arrangement is often found unsatisfactory. In the first place the 6-ft. mill is a little too large for one man to handle easily. With the aid of good chain-blocks he may be able to substitute a new muller for a worn one, or to put the shoe in to smooth up the ring, with perhaps an interval of half an hour between stopping and starting. But in changing the bull-ring, or other heavy repairs, the unhandiness of this size as compared with the 5-ft. mill becomes apparent. A crew of four men will often consume eight hours in changing one of these rings, on account of its weight and unwieldiness, when a smaller crew could make a similar change in three or four hours with the smaller mill. If the new bull-ring happens to have a soft spot in it, it may become useless and break from the pounding of the mullers, while yet practically unworn, and the mill must be stopped again for a shift. Besides, when running with the storage-bins nearly full, as often happens, it may become necessary to make some repairs on the Huntington. In these cases, when the single mill is used, the jig-middling gates must be closed, and the middling run into the tailing until the Huntington starts again. This may result in a serious loss. A common trouble with this mill has been the dropping of the horizontal gear-wheel until it meshes too deeply in the driving-gear, and jacking it back and keying it takes time, especially when this happens during either of the night shifts, when no repair-crew is about. The heating of the step is not unusual, necessitating a shut-down to thoroughly clean and oil this bearing or put in new bearing-buttons. Considering the question in the light of these practical points, it would seem that the use of two 5-ft. mills here would be an advantage, especially as the difference in the first cost of the machines is comparatively negligable, and more capacity at this point would provide against overloading, and also relieve the centrifugal rolls, which are crowded hard when the Huntington is closed, as they then get all the oversize from the small trommel. When a Huntington is used as a re-grinder, it must handle what feed is sent to it, and the amount of work it must do is not regulated by the operator, but by some one on the floor above, who does not worry about the Huntington man's troubles, and for this reason an elastic capacity is quite essential. In addition to all these considerations, I think any man who has worked for a length of time around a 6-ft. mill, with no repair-crew available, will agree with me in choosing the smaller size.

The accompanying flow-sheet shows the course of all ore in its passage through the mill. This system will soon be slightly modified by the addition of the two Callow screens.

MINING IN MALAY.—A British authority on mining conditions in the Federated Malay States says that the Malayan miner has two bad qualities. He still holds human life dirt cheap when he gives reins to passion, and he is probably the most inveterate and incurable gambler on earth. When, consequently, bad luck attends his speculations, there is always danger of his squaring accounts with Fate by miscellaneous stabbing. Running amuck is regarded in the peninsula as the natural result of losses at play. Here, then, would appear to be a most promising opening for that Radical reforming zeal, which, in the case of certain other Asiatic miners, would expel Nature—and the toilers themselves—with a fork. But there is one code of morality for Malaya, and quite a different one for the wicked Rand. It is proposed by the Colonial Office to confine the prohibition of the gambling farms in Malaya to non-mining areas, leaving them in full operation elsewhere. By this curious method of discrimination, the revenue derived from letting the farms, usually to Chinese speculators, will be maintained, while should some thin-skinned Radical protest against the vice being turned to account for State profit-making, it will be pointed out how gambling farms have almost vanished from the non-mining districts, where they have never been in nearly so much request.

COAL-TESTING PLANT IN DENVER.—J. A. Holmes, of the United States Geological Survey, has concluded negotiations for the land upon which a Government coal-testing plant will be constructed in Denver, Colo. The Chamber of Commerce of that city agrees to furnish the land. A completely equipped laboratory, with special apparatus for the treatment of coal and its by-products, will be built. The difficulties encountered in winding generators for potentials of 20,000 or 25,000 volts are primarily mechanical difficulties. A coil containing a large number of small wires does not make a very mechanical piece of work. It would, therefore, appear to be desirable, that the individual coils should consist of as few conductors as possible and that these conductors should be of such size as to enable the making of mechanically and electrically strong coils.

MINERALS IN ABYSSINIA.—Alluvial gold is found in considerable quantities on the Blue Nile and its tributaries. No reefs, containing gold in workable proportions, have yet been discovered. The difficulties attending the transport of machinery render it at present impossible to undertake any serious working. Iron is abundant and coal is known to exist in various parts. Silver, copper, and sulphur have been found. At present the impossible terms of the concessions granted for the exploitation of minerals have prevented any of them being seriously considered.

Converter Lining.

Written for the MINING AND SCIENTIFIC PRESS
By H. L. CHARLES.

Line the converter in the usual manner, then plug the tuyeres on the inside with stiff clay; fill the converter with slag (preferably converter slag, but slag or low-grade matte from blast or reverbatory furnaces may be used) and set away for one, two, or three hours; then pour out the molten slag and allow the shell that will form to cool off gradually. In about eight hours the converter will be ready to go back into service. Plenty of vent-holes should be provided in the shell to allow the steam and water to escape. The bottom should be tamped in about two inches deeper than when the fuel is used, to allow for the proper depth below the tuyeres for the shell that will naturally freeze on the bottom. The core should also

Fig. 1.

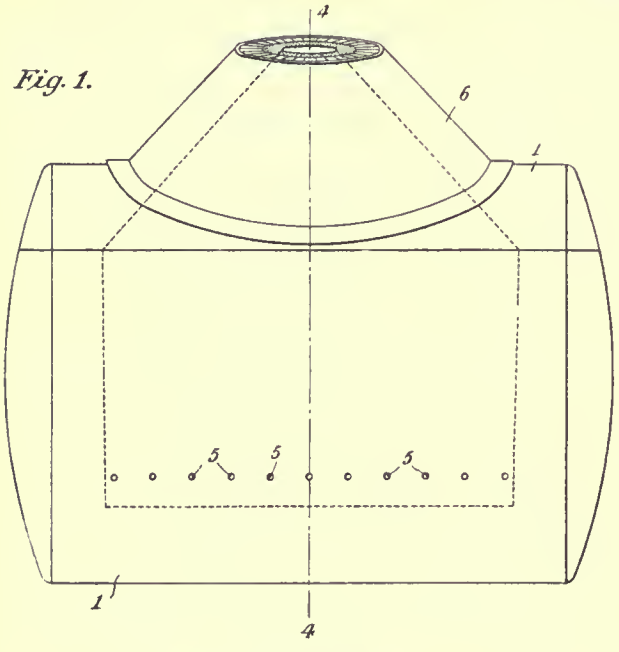
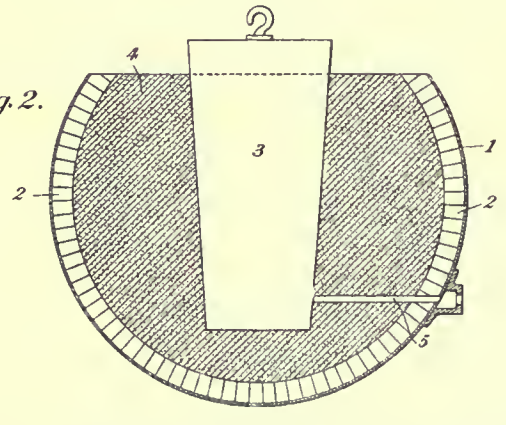


Fig. 2.



be three inches longer and two inches wider than when formerly used, to allow for the shell formed on all sides. The slag-shell should be knocked off on the tuyere side to prevent the first charge from spilling out and also running cool. By this process a more even corrosion of the lining will result, as well as a longer life for each lining. No caving down of the lining will be found from this method of drying, while it is quite frequent from fuel-drying. With the old way of drying it usually takes four and sometimes five shells for each stand, while with this process I am using about two and one-half shells per stand and could get along with two. With the longer life of the lining, I am making from one to three charges more than when we were using fuel for drying.

The process is now in use at the Butte Reduction Works at Butte, Montana, at the Boston & Montana smelter at Great Falls, Montana, and at the Bingham Consolidated smelter in the Salt Lake valley. Many others are commencing to use it, and should any metallurgist desire to learn more about the process from one who has used it for the past eight months successfully, he can write to A. H. Wethey, the manager of the Butte Reduction Works, who will outline the advantages, as he has used nothing but the slag-drying method at their new plant for the past eight months.

MALAY WOMEN AS GOLD MINERS.—Under a recent order made by the Resident, the royalty payable on alluvial gold won by persons working under individual mining licenses in the State of Pahang, in the Federated Malay States, has been commuted for a fixed payment of

Fig. 3.

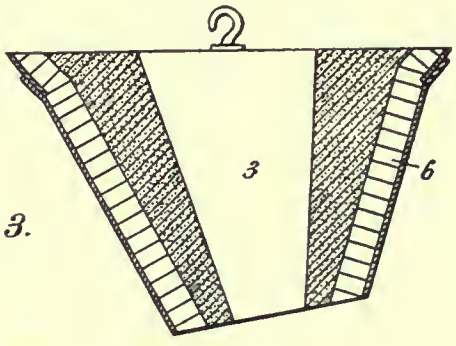
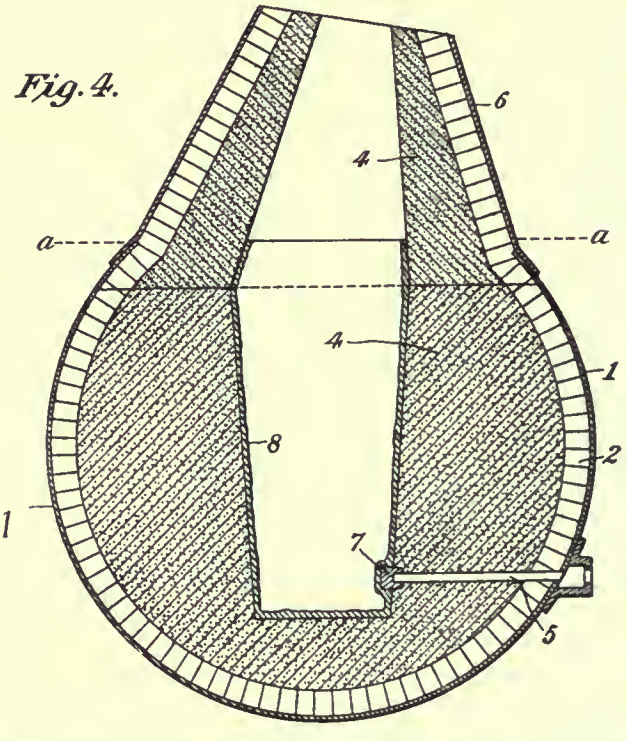


Fig. 4.



$5 a person per year, half rates being paid for six months or less. This alluvial industry is, according to the *Pinang Gazette*, assuming fairly extensive proportions. A feature of the work is that large numbers of Malay women are engaged and are keener on it than the men. They take great pains to wash carefully selected sand for small quantities of gold. The ore so obtained is seldom or ever exported, being either made into rough jewelry or sold to the local Chinese. Another form of primitive mining, favored by the Malays in many parts of the Ulu, is called *meriau* or *melanda*. Like the fossicking for alluvial gold, it consists of washing the sand of selected river-beds for tin ore, and here again the women are much in evidence and do more of this kind of work than the men. With a little luck and some perseverance, a fair quantity of ore is usually won in this way, from 50c. to a dollar's worth being obtained by one worker in a day, which is ample for the average Malay family to live on.

The Renaissance of Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By a Special Contributor.

The last few years have witnessed a wonderful revival of mining in the deserts of Nevada. The great volcanic area in the south and west, with its numerous irregular ranges and isolated buttes surrounded by a barren wilderness, are now the scene of an intense industrial activity.

When Tonopah was first discovered by J. L. Butler in 1899, the nearest railroad station was Sodaville, on the Carson & Colorado railroad. Across 60 miles of deep sand the track was laid to Tonopah, and this active little town has been established with 5,000 inhabitants and many of the conveniences and even luxuries now considered essential to modern life. The development of Tonopah in 1900 was only the breaking of this wave of development, which is now sweeping over the desert, leaving in its path mines of proved richness.

Nevada is undeveloped and only partially prospected. Many years ago the country was run over, productive mines were found and 'gophered,' but in most cases they died a natural death, victims of the desert. Of the old Nevada mines, the Comstock alone rivals the prospects of Tonopah and Goldfield. Austin and Pioche in the sixties were important producers, while the development of the Comstock in the seventies was accompanied by important discoveries at Mountain City, Jefferson Canon, Tuscarora, Ely, and Candelaria. Of these camps, Ely is now developing into one of the chief copper producers of the United States. Until recent years, copper has been neglected in Nevada and though several occurrences were known, they were generally left as valueless owing to difficulties of transportation. It is the richness of Tonopah and Goldfield that has enabled operators to overcome the local difficulties. These high-grade mines have built railroads, supplied electric power and water, and have triumphed over the opposition of nature.

The present movement covers a great area, not restricted to the southwest. Deposits of unusual promise are being developed from Rosebud, north of Reno, to Greenwater and the Colorado river.

There are three leading features in the development of this region, namely, the geological conditions, transportation, and available capital.

The topography tells the tale of the rocks. Isolated peaks and broad mesas, the natural result of denudation of volcanic necks and recent lava flows, surround the sage-brush plains. The repetition of these volcanic outbursts since the period of mineralization has in many cases an important bearing on the mining for gold. It has necessitated a careful study of the geological conditions and systematic exploration, in many cases with scant surface indications. Tonopah is a striking instance. The surface showings were confined to a small block of an earlier andesite roughly a quarter of a mile square. As a result of intersecting faults which dip away from the centre of the block, the productive area in depth is much larger than that indicated on the surface. The Montana-Tonopah shaft, sunk on a tract showing no outcrops, intersected this productive andesite at about 350 ft. and developed one of Nevada's greatest mines. This is a common feature in the desert, which makes a careful study of the geology essential, and often makes the productive area greater than is at first supposed.

The majority of the gold and silver camps are in volcanics of Tertiary age, the earlier flows being followed by a general mineralization by ascending hot waters during the decline of volcanic activity.

Prospecting in the desert is hard work. There is no game, no timber, and but little grass or water. The country is such as to facilitate transport, but the necessity for carrying everything is a serious drawback. There are few places that cannot be approached by wagons, but the everlasting question of water supply is always at hand. Two prospectors often take all their available supplies on burros, but not uncommonly one man spends all his time packing water, while his partner is prospecting. The straying of horses or burros (donkeys) is a constant trouble in the desert. Often they are taken to wells to pack water and to get a drink, but all the persuasive powers of the prospector will be useless to make them imbibe, although he knows that as soon as they get back to the camp, they will drink half of the water they have carried on their backs. But the most important feature in recent times is the automobile. Formerly the prospector would tell the promoter of the wonderful riches of the "biggest mine on earth"—usually a far-off deserted prospect, exaggerated by the hardship of the journey. But now it is common to see automobiles racing across the sand to see some discovery a hundred miles away on the flimsy evidence of a few specimens. And the 'prospects' in most cases consist of an outcrop only, rarely is there so much as a 10-ft. hole in the ground. An ordinary prospect with a shaft over 50 ft. is considered a mine, and in Nevada it fetches the price of a developed mine. The influence of the automobile in destroying the supposed horrors of the desert and in bringing the prospector in contact with capital, cannot be overestimated.

The general tendency during next summer will be to prospect the northern part of the State. In Churchill county, Wonder, a district possessing geological features similar to those of Tonopah, will be the centre of attraction, while Rosebud in the Seven Troughs district promises to become productive. At the latter place an important find was made last August. A flinty rock, resembling chert, formed an unpromising outcrop. It showed no valuable minerals to the naked eye. An assay gave returns of 13 oz. gold and 56 oz. silver per ton, and the first shot disclosed ruby silver ore. The property is now under development. The deposit is another of the occurrences that surprise the geologist in Nevada.

Railroads are being built in many directions, as fast as men and material can be collected, and already two are being built toward Death Valley. Copper has recently received a great deal of attention in western Nevada, both from prospectors and capitalists. It is a metal dangerous to those that do not employ specialists. Few of the people who are taking up copper prospects in Nevada have any conception of the many-sided problem presented by the production of copper, and as a result there is great danger of enthusiasm not tempered by judgment.

Smelters are discussed without any consideration of the all-important questions of fluxes, fuel, and water, while prospectuses of the most absurd character are floating broadcast. An interesting document recently described a district as a second Butte, saying that some malachite had been sold for $7 per pound for gem stones. A discussion as to smelting methods was followed by a confession that the total development was a 10-ft. hole showing wonderful oxidized ore. It is essential to secure a smelter site in good time, as they are few, but with the exception of Ely and perhaps Yerington, there are no copper mines sufficiently developed to warrant reduction works. But under this veil of absurd advertisement, there is progressing a surprising amount of steady development, which will, in some cases, produce important results. In the Yerington district, important deposits, suggestive of Globe, Arizona, are being systematically developed. The country, a highly metamorphosed limestone, with altered and garnetiferous zones, rich in epi-

dote, would immediately suggest copper. Sixteen miles from Wabuska in the foothills bordering Smith valley is the Nevada-Douglas Copper Co.'s property. Here there is an important mineralized zone in the limestone, which is altered and tilted by porphyry dikes to the north. The orebodies occur in this garnetiferous limestone at the intersections of fissures and, being due to replacement, they are irregular. Throughout the district the carbonates, also atacamite, and the red and black oxides occur with copper glance, and these oxidized ores, with their beautiful green and blue coloring, adorn many brokers' windows. Their very beauty has done much to create an unhealthy excitement in copper prospects, which are, of all mineral deposits, the most difficult to value, especially in limestone. The shipping of rich oxidized ores from California in the sixties and the long chain of deserted mines from Placer county to Mariposa should be a warning to capitalists to use precaution in tackling this difficult but lucrative business.

Copper mining is an attractive enterprise at the present time, and important developments may be expected in Nevada. The limestone of Yerington should produce some deposits of high grade, while the districts undergoing systematic development to the east and west of Mina and especially in the Greenwater district, promise to become even larger producers.

Communication with Goldfield did not reduce the cost of supplies to any large extent, but without it the present progress would be impossible. Greenwater is more accessible than is generally supposed. With the railroads now under construction, it will be within 15 hours of the coast. It is not an ideal situation for a copper camp, but there is no danger of farmers, and water is available at Ash Meadows for smelting.

The question of capital in Nevada is perhaps rather a delicate subject. It has been hinted that the desert is a favorite resort for wild-cats, and that its value as a mining country is overestimated. Of course every new country, and above all the high-grade mining camp, must have its black sheep. Considering the conditions it is surprising what an enormous number of properties are being quietly and systematically developed by the people of Nevada and their friends without any brass band methods and in many cases without incorporation. It is necessary to draw a sharp distinction between small stock corporations that put the money obtained by the sale of stock into the ground, and those that sell stock with no intention of mining in a serious and legitimate way. The former have done much to develop the country and must not be confused with the parasites of the mining industry. They may show bad judgment, employ incompetent men, and many will choose hopeless prospects and fail. In this country, which has given so many surprising results, it is good policy—and the better companies realize it—not "to put all the eggs in one basket," but to take up prospects in different districts, if capital is available to 'hatch' the best of them. Conditions are changing and becoming better for the serious operator. Prospects can now be bonded on reasonable terms for development, and as a result many important mines will be heard of in the near future.

Of the nondescript wild-cat schemes little need be said. They are an unsavory element in every new mining camp that should be diagnosed by serious investors. Many will die a natural death in the next few months. A general depression in mining in Nevada is likely to result from a strained labor situation and general financial conditions, and this will be the last chapter in the history of most of the illegitimate mining schemes.

The future of many mines is assured, and the stockholders realize it. As a result, a depression will have its beneficial aspect. The causes of failure are many. Overenthusiasm and absurd capitalization of prospects coupled with an inability of many so-called engineers to gauge the difficulty of any undertaking in the desert, for which fuel and water are required, is becoming a serious menace to the mining interests.

The relations of operators and labor must be thrashed out and the country is ready to stand it now. If this necessitates a temporary shut-down, it will enable the railroads to relieve the present congestion and the camps will be scoured of many of their most undesirable elements and will return to a state of quiet and legitimate prosperity.

STREAM FLOW IN ALASKA.—The stream-flow measurements that the United States Geological Survey has been making for a decade or more on important streams in various parts of the United States were, during the summer of 1906, extended to Alaska, in order that information might be obtained regarding the amount of water available for the economical development of placer mines and possible water powers in that Territory. The results of the work have just been published as No. 196 of the series of Water-Supply and Irrigation papers. That such information is essential to the profitable working of placer deposits is not always fully realized, and the lack of it has often been responsible for the financial failure of enterprises that promised success. Limited funds and time necessarily restricted the investigations to a comparatively small area, and the Nome region of Seward Peninsula was selected because of its extensive mining interests. Stream-flow data were collected at 45 stations, and a careful study was made of the conditions affecting the water supply. It is believed that the data obtained, while far from exhaustive, give a fair idea of the conditions of flow that may be expected in the vicinity of the gauging stations, and that they will prove valuable in estimating stream flow in other parts of the region. As a result of the great value of the waters for use in the auriferous gravels, water-power possibilities on the peninsula have been neglected; but the development of a large number of excellent power sites is feasible both from an engineering and a financial standpoint, and the attention of mining men is directed to such development. The report summarizes the hydraulic development of the region, and contains a much-needed warning against construction and installation of expensive machinery without the necessary preliminary investigation and engineering advice. The report may be obtained free of charge by applying to the Director of the United States Geological Survey, Washington, D. C.

TUBE-MILLS.—The tendency is to shorten the tube-mills in use on the Rand. At the Village Main Reef, the length of tube has been 22 ft. and the early machines were two feet longer. In ordering new tube-mills it is specified that they shall be 5½ ft. shorter, that is, only 16½ ft. The diameter remains unchanged. It is hoped to decrease power consumption.

SUMMER SCHOOLS.—The Massachusetts Institute of Technology, Boston, issues a syllabus of the summer courses for June and July, 1907. Cornell University publishes an announcement of the sixteenth summer session, in July and August.

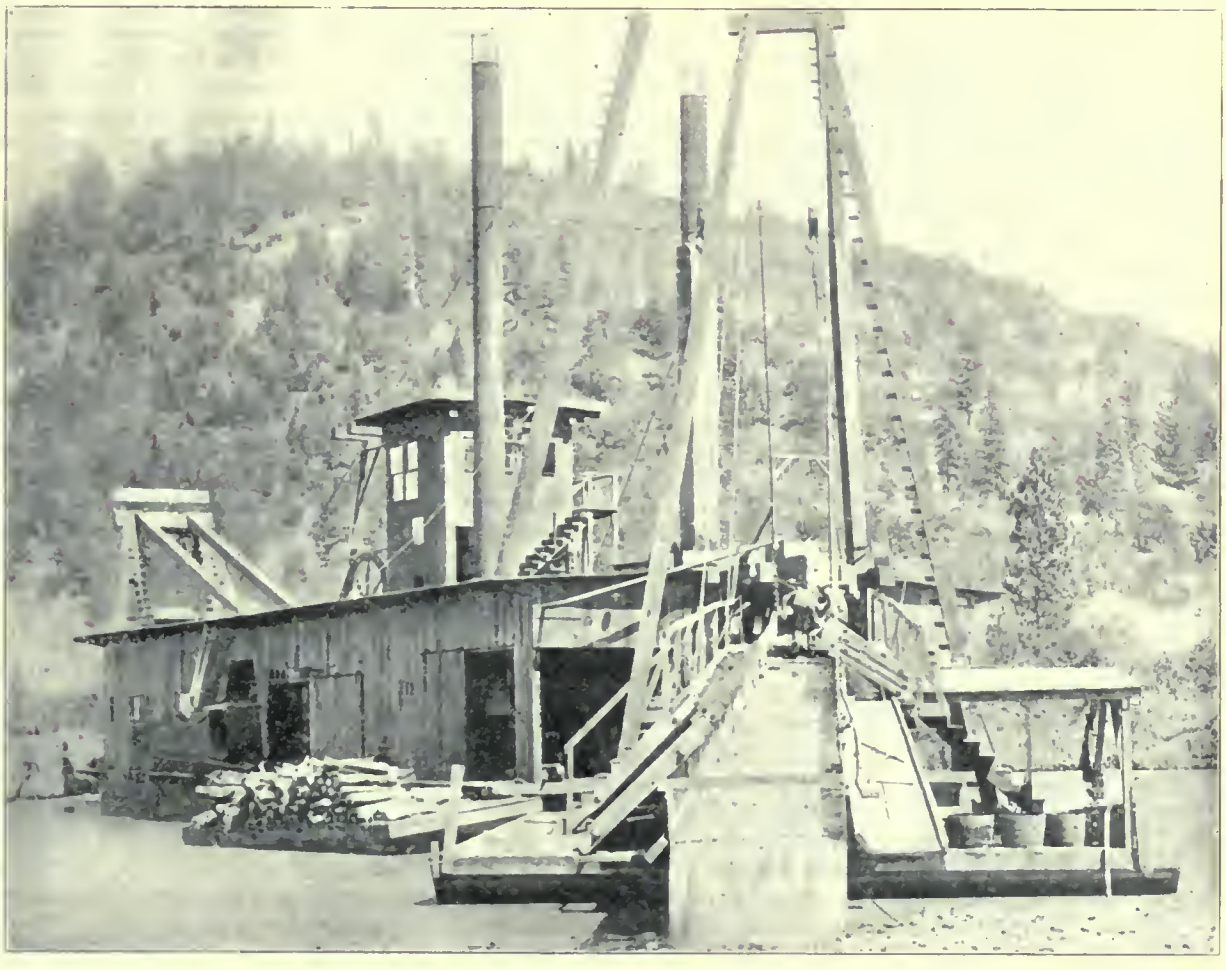
CRIPPLE CREEK DRAINAGE ADIT.—Bids for the construction of this deep 'tunnel' in the Cripple Creek district, Colorado, will close on May 15, 1907. Applications should be made to E. D. Marr, Secretary of the Tunnel Company, at Colorado Springs.

Sluices and Riffles in Dredging.

Written for the MINING AND SCIENTIFIC PRESS
By DENNIS H. STOVALL.

The best sluices ever tried on the Oregon dredging field are given a separate barge on which to float, and besides the 120 ft. of flume outside the dredge, a double system of grizzlies is employed inside. It is easier and less expensive to save 90% of the gold in the gravel by ample sluices, riffles, and flumes, than to provide more powerful equipment with which to dig or scoop out twice as much ground but save only 45 per cent.

By mounting the outer flume and riffles on a separate barge, it can be swung from point to point and thus allow ample dump-room and obviate choking. The outer flume has a width of four feet, with a drop from end to end of seven feet. It is mounted to the barge by trestle, and is perfectly balanced, so that it is easily swung by cable from the pilot house of the dredge. This flume or sluice is provided with Hungarian riffles.



Pontoon Carrying Sluices of a Dredge. Flume 120 Ft. Long.

In working cemented ground, such as is found in southern Oregon, and in other Pacific Coast districts, much agitation and an abundance of water is necessary; otherwise a great part of the gold will be lost. It is on ground of this character that ample sluices and riffles prove effective, and, in fact, a dredge thus provided is the only machine that has proved a success.

In a dredge of this type, the gravel is dropped from the buckets into a hopper on the deck. This sheer drop of from 10 to 15 ft. in itself proves effective in breaking up the cemented gravel. From the hopper it is conveyed to a revolving grizzly, with perforations five or six inches in diameter. This grizzly operates much on the principle of the 'riddles' of a threshing machine, shaking over all the coarse stuff, and dropping the smaller and lighter through the holes. The interior of this grizzly is supplied with a number of jets, by which a fresh and additional supply of water is thrown upon the gravel. The large boulders are separated from the small, and slide over the grizzlies to the side of the boat, where they are dumped, the remainder of the material passing through a funnel-shaped conduit to a settling-tank. It is in this settling-tank, which is provided with Hungarian and strap riffles, that a great portion of the gold finds lodgment. From the settling-tank the remainder of the water and gravel is carried or elevated to the upper end of the long sluice-way outside.

As already hinted, a system of sluices and riffles of this sort requires an abundance of water, and to supply this water there must be pumps of ample capacity. In the dredge using this particular system, centrifugal pumps are employed. These are two in number, the first being a six-inch pump to give water for the upper or double set of grizzlies. Water is first admitted at the hopper where the gravel is dumped from the buckets. This water assists in melting the cemented or compact ground, and also flows down and aids the grizzlies in their work of disintegration.

After the sand and gravel have left the well or settling-tank, which is the second step in separation, it is lifted or conveyed by a 12-in. centrifugal pump to a height of 16 ft., or to the head of the outer pontoon sluice. The riffles can be easily lifted and rinsed, and are effective in saving the gold. As is proved by the gold in the settling-tank, the best method of gold-saving is one that obviates boiling as much as possible. The grizzlies and flume are given a fall of one inch in five. All are provided with replaceable linings by which the finest gold is caught.

On a machine of this character, where cemented ground is handled, ample provision must not only be made for

thoroughly breaking up the gravel and separating the metallic particles, but it must be built to withstand twice the strain to which a dredge is subject on average ground. The barge of the machine, as illustrated herewith, is iron-strapped and bolted, and the stud timbers, 112 ft. long, are 3 by 3 ft., and cut from whole trees of Columbia River yellow fir, a wood that has great elasticity and strength. The digging-beam for this dredge is 80 ft. long, and serves the purpose also of a frame for the chain, the latter carrying 45 buckets of eight cubic feet capacity each. The alternating links are of the slug or telescope pattern, with multiple-connecting projections, and is one feature of the dredge that gives it great strength. The lifting force of the machine is 80,000 lb., and this force is exerted principally on the digging-frame, and conveyed through the machine by the stud-timbers, none of the strain coming on the shell or hull of the barge, thus obviating leaks and breaks.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A cleavage fragment of Barite was sent by G. E. W., of Los Angeles.

J. H. K., of Paradise, Ariz., sends a specimen of Granite somewhat mineralized with Pyrite.

The three rocks marked S. S., Hahn's Peak, Colo., are: No. 1, Slate; No. 2, Quartzite; No. 3, Slate.

The specimens from F. E. W., Redding, Cal., are: No. 1, Quartz, Pyrite, and Calcite, with crushed country rock; No. 2, Pyrite in Quartz; No. 3, Quartz with a little Pyrite.

The rocks from Placer county, Cal., sent by W. B. H., of San Francisco, are: No. 1, amphibolite Schist; No. 2, volcanic Tuff; No. 3, volcanic Tuff; No. 4, sericite Schist; No. 5, altered mineralized Schist.

The rocks from Jalisco, Mex., marked L. B., are: No. 1, altered volcanic rock perhaps Andesite; No. 2, brecciated Andesite; No. 3, Diorite; No. 4, banded Rhyolite, No. 5, Pyrite; No. 6, altered volcanic rock.

C. H. F., of Christmas, Ariz., sends: No. 1, Quartzite with Pyrrhotite; No. 2, contact rock with Epidote; No. 3, serpentinized rock with Pyrite; No. 4, serpentinized Diabase; No. 5, Diabase; No. 6, black Slate with Chalcopyrite.

The samples from Hillside, Ariz., marked A. L., are: No. 1, Quartz and Limonite; No. 2, Copper-stained rock; No. 3, Quartz, with Iron and Manganese oxide; No. 4, Quartzite; No. 5, Magnetite; No. 6, Quartz, with red Hematite.

The mineral specimen from J. N. McL., of Denver, contains Silver and Copper, with Tellurium instead of antimony. No reaction was obtained from bismuth. Resembles hessite, but requires a chemical analysis definitely to determine the species.

A. B. C., of Battle Mountain, Nev., sends: No. 1, Quartzite; No. 2, Quartzite; No. 3, Slate; No. 4, Dacite. The darker pieces of dacite contain black glass and are probably a contact phase of the lighter crystalline rock. The inclusion is shale. The clear grains from the wash are quartz.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A re-location of a mining claim can be made only where there has been a prior valid location, and the rights of the original locator have terminated. A re-location is authorized only for forfeiture or abandonment of a prior location. By making a re-location the locator makes admission of the validity of the prior location and precludes himself from contesting it. "Mining claims are not open to re-location until the rights of a former locator have come to an end. A re-locator seeks to avail himself of mineral in the public lands which another has discovered. This he cannot do until the discoverer has in law abandoned his claim and left the property open for another to take it up."

Zerres *v.* Vanina, 150 Fed. 564. (Jan., '07.)

A notice given by a re-locator is said to be a solemn admission in an instrument which is made a matter of record that such re-locator is not a discoverer of mineral, but an appropriator thereof, on the ground that the original discoverer had perfected his right. It becomes in a certain sense an instrument of title, a record; and it is the equivalent of an admission of record to the original locator that such re-locator claims a forfeiture by reason of a failure of the first locator to make his annual expenditure.

Zerres *v.* Vanina, 150 Fed. 564. (Jan., '07.)

The owner of a mine is liable to the owner of property on a stream below the mine for damages that result from acidulated and offensive water pumped from such mine and thrown into the stream, although such disposal of the water was necessary to the operation of the mine.

Bowling Coal Co. *v.* Ruffner, (Tenn.) 100 S. W. 116. (Feb., '07.)

Where the grantee in a deed of certain lands agreed that his grantors could remain in possession of the premises during their natural lives without the payment of any rent. At the time of the conveyance there was a coal mine on the land which had been opened and operated. The grantors occupied the land and mined coal from such open mine for eleven years. Under these circumstances it was held that a person claiming under the grantee could not dispute the life estate of the grantors in the coal.

Robb *v.* New York &c. Coal Co., (Pa.) 65 Atl. 938. (Jan., '07.)

In this connection it may be stated that the general rule is that a life tenant may continue to operate a mine that had been open and operated prior to the time that he acquired his estate.

The fact that the negligence of an employee operated with the negligence of the employer to produce an injury to a co-employee, which resulted from the negligent failure to properly prop the roof of an entry to a mine, was held not sufficient to relieve the operator of the mine from liability.

Madden *v.* Saylor Coal Co., (Iowa) 111 N. W. 57. (March, '07.)

In order to entitle an employee to recover for injuries received by the falling of the roof of an entry to the mine of his employer, it is incumbent upon him to show that the employer was negligent in using props in the manner he did, and he may show another safe and convenient way of supporting such roof. And where the employer offered evidence of a custom of supporting similar entries, it was held competent for the employee in rebuttal to show how the roof of an entry should be timbered.

Madden *v.* Saylor Coal Co., (Iowa) 111 N. W. 57. (March, '07.)

The proprietor of an open estate has no legal right to discharge into a natural stream the waste oil and salt water proceeding from wells sunk on his premises, and he is responsible for any damages resulting therefrom to an estate below.

McFarlain *v.* Jennings-Heywood Oil Synd., (La.) 43 So. 155. (Feb., '07.)

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Editorial.

LETTERS FROM a self-made miner to his new foreman ought to give some useful hints to those about to manage a mine, and therefore Mr. Matt. W. Alderson's correspondence will be read with interest. The correspondence is fictitious, but it will be found strangely true in its regard for the essentials of practical mining. We expect to publish four of these letters in successive issues.

SUCH contributions as that of Mr. Charles D. Kaeding, on the method of building foundations for a mill in Korea, are of especial value. The writer is the assistant general manager for the Oriental Consolidated Mining Company and supervised the work that he describes. Any record of the weak parts or the successful features of a mill, as made manifest in the course of work, are of particular value to the profession.

STEAM-SHOVELS are becoming an interesting feature of copper mining, especially at Bingham and Ely, where large masses of soft porphyry can be exploited by this method. Mr. J. W. Abbott's notes on Bingham will prove interesting. The illustrations remind one of the big iron mines of the Mesabi and suggest the dimensions of the copper deposits into which the steam-shovel will dig.

OUR LONDON CORRESPONDENT gives an interesting abstract of the annual reports of some of the big West Australian mines and, incidentally, these afford an example of the change that has taken place in English methods of keeping mine accounts. Development and exploration are no longer debited to capital, and new mills are no longer erected with funds raised on debentures. The revenue account is made to carry them all, as it ought to do, for a mine is a liquid asset in the sense that it is running away, as its resources are exhausted by mining and milling. There was a time when machinery stayed on the books as 'capital' long after it was valuable chiefly for scrap iron, but nowadays each year a large fraction of the original cost is written off the accounts for depreciation, so that the price of it has been wiped off the books before it has ceased to be useful. The machinery of an exhausted mine is a pathetic derelict. Time was also when 'dead work' was debited to capital, so that mining costs appeared beautifully small, and the manager got great credit as an economist. But such methods are now in bad repute, and the management of mines at London has gained by the accumulated experience of the last generation. In these matters such houses as John Taylor & Sons, the Exploration Company, the Consolidated Mines Selection Company, and Bewick, Moreing & Company have served to educate directors,

and legitimate mining owes them a debt that it is pleasant to record.

THE SURVEY AT WASHINGTON issues press bulletins, of which the last is numbered 278, series of 1907. In the lower corner the announcement is made that Mrs. Harriet Connor Brown will relinquish to others the "pleasant duty" of preparing these bulletins, as she is changing her residence to Chicago. While we have not availed ourselves of the material furnished in these bulletins as much as some of our contemporaries, nevertheless we would like to be first in recording the general excellence of Mrs. Brown's work and in wishing her good fortune in her new sphere of activity.

NEW YORK has another mining market, for the Produce Exchange has a new department in which mining shares are bought and sold. As yet the business done is small, but it looks promising, at all events it is marked by more dignity and comfort than the peripatetic bourse on the Curb, and it is more distinctive than the dealings in three or four mining companies now quoted on the regular Stock Exchange. Considering the magnitude of the business done at New York in mining stocks, it is curious that there should be nothing to compare with the mining department of the London Stock Exchange. A well organized mining exchange or a representative subdivision of the Stock Exchange would be of great service in facilitating dealings and in regulating them, so that the gambling of the moment might tend to separate itself from the sane speculations afforded by reputable companies. The business of mining has reached dimensions warranting better recognition from the brokers of Wall Street. At present the Curb is the principal market. It is something of an absurdity, especially in wet weather. Moreover it is used in advertising new enterprises, for stock sold privately between brokers on the Curb can be recorded in the newspaper quotations of the day and thus a fictitious market is created, sufficient to attract the inexperienced. It is a free-for-all institution, offering every facility for 'wash shales,' that is, a transaction in which two brokers make a fictitions trade for the sake of recording a quotation. The Curb is chosen, in preference to the Stock Exchange, by companies that dislike to furnish information concerning the details of their business; that is why Standard Oil is a Curb stock; the same applies to the Northern Securities and to other issues of a mysterious kind. The members of the Exchange dislike it, as is reflected in the story of the broker who was asked by a yonng woman at a dinner party what he thought of Omar Khayyam and he replied harshly: "I never deal in Curb stocks."

GOVERNOR SPARKS is at it again. We do not know him, nor have we any prejudice against him personally, except on one account, namely, the lending of his name to mining companies of a questionable sort. A full-page advertisement in a daily paper announces that "Governor Sparks' Company makes a first shipment of ore," and then follows the statement that this is the "last chance to buy this $5.00 stock at 50 cents. Price advances to 75 cents on Saturday." Mr. John Sparks is Governor of Nevada, and he ought to have more respect for his honorable office than to play the fool in this way. People do not offer a stock worth $5 (omitting the pretentious ciphers) for 50 cents; any man that buys something worth $5 for less than $5 can expect to get $5 worth of experience, and nothing more. The mine that is making this loudly heralded first shipment of ore is "conservatively capitalized at $5,000,000," and "in view of its immense acreage, and the millions of tons of ore known to be in the 50 claims, a capitalization of $20,000,000 would not be inconsistent." No, it would not; it is as easy to get acreage in the desert as it is to water the stock. The whole affair is so bad as to mark the crest of speculative folly in wild-cats. Here is the superintendent making a sworn statement that he has 120 tons of ore sacked and ready for shipment. A lower assay company certifies that some samples yielded 11.5 per cent copper, and to this is added the information that "many of the world's greatest copper mines produce ore that assays only from 3 to 7 per cent copper." This is true, but the inference is false, as false as words can make it. Assays do not make a mine. The whole thing is preposterous. The Governor ought to be ashamed of being the president of such a company, as of others with which he has been connected. The use of his portrait as part of a flamboyant advertisement brings ridicule on the office that he holds.

Affairs on the Rand.

OUR CORRESPONDENT at Johannesburg is always interesting, but last week his letter was of more than usual importance. Owing to the apparent drifting policy of the new Government, the outlook for labor is distinctly bad in the Transvaal and the future of the mines is endangered. On the face of it the statement that the Boers consider it better to make the mines last a long time, instead of pushing the production, seems likely to be true, for that is the idea in most countries except America, Canada, and Australia, the inhabitants of which are mostly in a hurry. Modern ideas on the exploitation of mines favor that rate of production which will yield the maximum ultimate profit, that is, looking at a mine as a mass of ore, it is the purpose of the engineer to take it ont and extract its valuable contents in such a way and in such a time as will give the biggest return on the capital employed. It is possible to extract ore so fast as to be wasteful, not only because of the carelessness that accompanies an extravagant production, but also because too rapid operation leads to the neglect, and eventual loss, of a certain proportion of low-grade ore, the treatment of which at a profit is likely to be made possible either by an enlargement in the scale, rather than the rapidity, of operations, and by the metallurgical improvements that are constantly being devised. Thus, the bonanza mines at Kalgoorlie and at Johannesburg wasted a lot of good ore in the early days of those districts, when costs were high.

making a profit per ton only a half what the same ore would yield now under better conditions. On the other hand the exaggerated European, and also Mexican, way of running a mine in the interest of a deserving management or an amicable community, and spreading the output over a long term of years in order to keep engineers and workmen pleasantly employed, leads to a loss of profit, because fixed expenses eat up an excessive proportion of the yield. The amortization of capital is a phrase the real meaning of which, as applied to mining, is a thing of yesterday. It does not appeal to the Boer, who looks at the gold mines from the standpoint of the fixed community in the Transvaal rather than the shifting body of shareholders in Europe. Our correspondent is an engineer with a keen sense of responsibility, therefore his statement concerning the closing down of some of the poorer mines, is serious. The withdrawal of capital, which also he predicts, is much to be regretted, for while some of it will be diverted to America, the first result will be to undermine confidence in mining as an investment and to accentuate the dependence of all industry upon an unstable and increasingly expensive labor supply.

Secondary Enrichment.

ORE DEPOSITION is a subject of perennial interest, and in this issue Mr. Hiram Hixon revives a discussion, to which we hope others will contribute. Mr. Hixon is always interesting in his expression of opinion, because of his delightful independence, which often takes the shape of originality of thought. As regards the theory of secondary enrichment, there is no doubt that it has gone far to illuminate the perplexities of ore occurrence, and while it may have been applied recklessly by some writers, it has fully justified itself. The rich deposits at Cobalt have afforded subject for dispute, and we note with interest the debate that occurred at Toronto recently. Mr. Hixon held his lance against no less an authority than Mr. C. R. Van Hise, and while he stood in a position of lonely splendor on that particular occasion, we venture to believe that his ideas, as expressed then and now, will find support among mining geologists. The tendency is to restrict the sphere of secondary deposition, to credit ascending waters with greater ability to form bonanzas, and to recognize that thermal waters are largely of magmatic origin.

In a recent suggestive contribution to this journal, Mr. James F. Kemp, of Columbia University, touched upon this matter in his usual informing way. Referring to the most remarkable of concentrations by secondary enrichment, namely, the chalcocite orebodies of Butte, the Professor quoted the suggestion that these deposits are due to uprising solutions of copper, set in motion by thermal activity associated with the late intrusion of rhyolite. It appears likely that the deposition of copper is the last notable act of the ascending solutions, rather than one of the results of descending surface waters. The occurrence of copper below zones rich in other metals, and far too deep for the penetration of the ground-water, justifies a restricted application of former theories. At Butte, despite the shattered condition of the country, consequent upon three or four successive periods of fracturing, the chalcocite has been found from 1,000 to 2,000 feet below the possible bottom of the ground-water, so that it is wholly unlikely that solutions enriched at the expense of the upper parts of the lodes could have been responsible for the orebodies of the deep levels. Moreover, at Mt. Morgan, in Queensland, and at Bingham, in Utah, copper sulphides have been found in notable quantity underneath bodies of ore rich in other metals, but barren of copper when exploited near the surface and for several hundred feet below it. In these cases, it is not at the base of the oxidized zone or near the bottom of the ground-water that the copper has been found, but at a depth apparently beyond the reach of superficial agencies and within the domain of the uprising solutions, to which, at another time and under different conditions, the ore deposits owe their primary origin. We are thoroughly of the opinion that Professor Van Hise and other authorities have paid too little attention to the comparative shallowness of the ground-water, which does not extend indefinitely downward from its well-recognized upper level, but is really a thin blanket of water, three or four hundred feet thick. It is artificially depressed by mining operations, and it is tapped by the lateral workings in the upper portion of a mine so as to drain into the shaft. Miners know what it means to "take up" the water at the 700 or 800-ft. level, and they know that by the use of dams and pumps they can keep the bottom of their mine dry. That is because they are below the zone of ground-water.

At Cobalt there is a practical interest in this problem of economic geology, and we hope that the engineers in charge of operations will collect some useful facts. In regard to Mr. Hixon's reference to carbonaceous matter as a precipitant, this is a subject that the present writer studied with keen interest several years ago, notably at Rico, in Colorado; there the gold and silver veins are rich only while traversing shale, limestone, and sandstone where these rocks are blackened by carbonaceous matter. However attractive the theory, it must be applied with hesitation, for of this we are sure, namely, that while the solvents for gold are few and sparingly distributed, the precipitants are many and everywhere obtainable. In the case of silver, the solvents are more numerous, and the solution of the sulphide by surface waters is chemically reasonable, but even in this case a precipitant seems to lurk at every turn, and we need not lay stress on any particular one. We agree with Mr. Hixon, however, that the association of gold and silver with carbonaceous matter is a coincidence too frequent not to have a relation. In some cases the carbon may be an accessory after the fact, as indicative of hydrocarbon gases, or it may have been indirectly responsible by precipitating iron sulphide from sulphate waters, the iron sulphide becoming the immediate agent in the precipitation of the precious metals. It is a fascinating subject, and we hope that some of our mining geologists will give their testimony, to the end that all of us may learn something more.

Personal.

GEORGE W. MAYNARD is on his way to the Yukon.

F. L. BOSQUI has returned from Kirkland, Arizona.

C. C. BURGER has returned to New York from Nevada.

HORACE V. WINCHELL is at Butte, on professional work.

A. F. WUENSCH has returned to Denver from Mackay, Idaho.

JAMES W. NEILL is examining mines near Congress, Arizona.

E. A. H. TAYS left San Francisco for Tucson, Arizona, on May 6.

J. W. MERCER is at Los Angeles. He is expected in San Francisco.

J. POWER HUTCHINS has returned to New York from Dutch Guiana.

LOUIS S. NOBLE has been examining mines in Mohave county, Arizona.

HOWARD D. SMITH has been at Oroville investigating dredging ground.

S. H. BROKUNIER has been examining the oilfields of the Indian Territory.

W. H LINNEY, formerly superintendent of the Nipissing mines, is in New York.

PAUL JOHNSON was in San Francisco on his way from Vancouver to Reno, Nevada.

J. H. MACKENZIE is examing mining property near Ione, in Amador county, California.

L. M. COCKERELL is manager for the San Cayetano Mines, Ltd., at Guanajuato, Mexico.

FRED. G. FARISH sailed on the 8th inst. from New York for Amsterdam, on professional business.

S. F. PARRISH has opened an office at Tonopah, Nevada, having moved thither from Los Angeles.

LUCIUS J. BOYD is now general manager for the Chase-Andrews Concentrating Co., at Lovelock, Nevada.

J. PARKE CHANNING has been elected president of the Alumni Association of the Columbia School of Mines.

EDWIN C. HOLDEN has joined the firm of Hill & Irvine, which will be known henceforth as Hill, Holden & Irvine.

H. E. WEST is in London, but he expects to return to the Spassky copper mines, in Siberia, within a few weeks.

H. S. MUNROE and JOHN J. ROBERTSON are leaving Parral, Mexico, to go to the Argentine, in South America.

EDMUND JUESSEN has an office in the McCornick Block at Salt Lake City. He is now examining mines in California.

W. L. COBB has returned to Sausalito, Cal., from examining mines in San Bernardino county, in behalf of French capitalists.

CHARLES HARRIS has left Colorado for British Columbia where he has been engaged by a large placer mining company at Atlin.

C. C. LEAVITT, JR., has resigned as superintendent of the Copper King mine, at Fresno, to become general manager for the Fresno Copper Co., Ltd., of Glasgow.

F. F. WEBER, reeently superintendent of the New Almaden quicksilver mine at New Almaden, in Santa Clara county, California, passed through San Francisco this week on the way to Benson, Arizona, to inspect some properties.

T. B. BASSETT, for the past two years general manager of the Belen Mining Co., at Cumpas, Sonora, Mexico, resigns his position to devote more time to other branches of his profession, resignation to take effect during the month of June.

B. C. SHIPMAN, for eight years with the Westinghouse company as erecting engineer of high-tension plants, has opened an office in the Atlas Bdg., San Francisco, where he can be consulted on mining and transmission power lines and kindred subjects.

Latest Market Reports.

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
May 3	24⅜	6	6⅝	65⅞
" 4	24⅜	6	6⅝	65¼
" 5	Sunday.	No market.		
" 6	24⅜	6	6⅝	65¼
" 7	24⅜	6	6½	65⅜
" 8	24⅜	6	6½	64⅞
" 9	24⅜	6	6½	64⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	May 2.	May 9.
	£ s. d.	£ s. d.
Camp Bird	1 3 6	1 4 0
El Oro	1 7 6	1 6 9
Esperanza	1 18 0 ex div.	1 16 9
Dolores	1 11 3	1 7 0
Oroville Dredging	0 17 6	0 17 0
Stratton's Independence	0 3 6	0 3 6
Tomboy	2 0 6	1 18 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices May 2.	Closing Prices May 9.
Bingham Central	1½	1½
Boston Copper	30½	29
Calumet & Arizona	176	177
Cumberland Ely	9	9⅞
Dolores	8	8
El Rayo	6	6⅛
Guanajuato Con	4	4
Giroux Con	8	9
Greene Con	21¾	4½
Nevada Con	11¾	5⅜
Nipissing	14	13⅜
Tennessee Copper	4	
Tonopah Ex		
Tonopah-Belmont	4¾	4½
Tonopah	17⅝	18
United Copper	61½	62⅜
Utah Copper	29¼	29½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices May 2.	Closing prices May 9.
Adventure	3⅞	3⅞
Ahmeek	80	90
Allouez	51	50
Amalgamated	97⅜	94
Arcadian	7¼	6¾
Atlantic	14	12¾
Balaklala	10	9⅛
Bingham Con	20¼	18¼
Boston Con	30½	.....
Butte Coalition	27⅞	27¼
Calumet & Arizona	176	175
Calumet & Hecla	860	860
Centennial	32	30
Con. Mercur	38	38
Copper Range	83¼	81⅛
Daly-West	16¼	16½
Franklin	18¼	16½
Granby	120	130
Greene-Cananea, ctf	16¼	15⅞
Isle Royal	21	18½
Mass	7¼	6½
Michigan	15½	14
Mohawk	89½	90
Mont. C. & C.	2⅞	3
Nevada Con	14¾	15½
North Butte	92¾	90½
Old Dominion	56½	54½
Osceola	148	140
Parrot	23½	22
Phœnix	1½	1⅜
Quincy	132½	128½
Raven	1⅞	1⅝
Rhode Island	6¼	5⅜
Santa Fe	3½	3¼
Shannon	18¼	17½
Superior & Pittsburg	19	18¼
Tamarack	127	118
Trinity	22¾	22
Troy-Man	2	1½
United Copper com	61½	61
Utah Copper	61½	63¾
Victoria	8⅝	9
Winona	8½	8
Wolverine	160	164
Wyandotte	1⅜	1¼

(By courtesy of E. F. Hutton & Co., 490 California St.)

Mining Summary.

ALASKA.

Reports from Ketchikan indicate that the reorganization and sale of the properties of the Alaska Copper Co., at Coppermount, on the west coast of Prince of Wales island, was not concluded. The mine and smelter have been closed for several months awaiting the consummation of negotiations with capitalists at Duluth, Minnesota. At one time it was announced that the deal was closed, but it now looks as though it had been called off indefinitely.——The Hydah mine will soon ship to the Hadley smelter, as the tramway and bins are ready for use. The tramway is 2,000 ft. long, connecting the beach and the big open-cut where the orebody has been opened for a width of 40 ft.——The Hadley furnaces have been blown in again.——Work will be resumed at once at the Moonshine, at Cholmondeley sound. ——Sinking in the main shaft of the Red Wing mine at Copper City is still in progress, and it will be continued 80 ft. more, to the 200-ft. level, where driving will start.

ARIZONA.

GILA COUNTY.

Many companies have been handicapped on account of delays in delivering machinery at Globe, but new hoists have arrived for the Superior & Boston, Calumet & Globe, and Globe-Arizona properties. The ore shipments from the various properties continue to be large, and, although the Old Dominion plant is unable to treat custom ores, it is still receiving all shipments. Four furnaces are running, and, with the exception of some low-grade sulphides from Cananea, all the ore being smelted is from the company's own mines. The sulphide stope on the 14th level is supplying a large tonnage, as is also the west stope on the 9th level. Connections are being made to open the Kirky vein on the 11th and 12th levels, and a drift will be run to open it on the 14th level. No. 4 cross-cut on the 14th level has been started, and should reach No. 1 vein by the end of this month. The station on the 14th level has been cut, and the head-frame for the electric hoist is being erected. B shaft is now almost down to the 11th level and the connection with A shaft on the 10th level will be made this month. The construction work at the Old Dominion is progressing well, but the delay in the arrival of structural steel for the extension of the smelter building may retard the erection of No. 5 furnace. No. 1 converter-stand is being moved to make room for the new furnace. Coke is coming in more rapidly, and there are now 150 cars between Bowie and Globe.——The Arizona Commercial properties are maintaining regular shipments of sulphide ore from the Copper Hill mine to the Old Dominion smelter, and are also sending to the smelter some iron ore carrying copper and a little silver. Shipments of silicious ore are being made to Douglas. Pumps have been installed in the Black Hawk shaft, and sinking has been resumed. By the first of June the inclined shaft will be 600 ft. deep.——At the Great Eastern shaft of the Superior & Boston company, a cross-cut is being run to the south on the 160-ft. level, and the north cross-cut is being continued to intersect a small vein. The Limestone shaft is down 124 ft. and a level will be driven from the 118-ft. point.

PINAL COUNTY.

(Special Correspondence).—J. W. Sharpe, who has taken a working bond on the George Westfall group of copper claims, situated in the Red Hills district, east of Florence, is pushing development work with a force of miners, with George Westfall as foreman. A new prospect shaft was started, and it is nearly 100 ft. deep. This shaft is well situated, and is yielding some rich ore, consisting of copper carbonates, and oxide, and chalcocite.—— The Ray and Gila copper companies have ordered a number of hoisting engines to be placed on their 2,000 acres of mineral ground at, and surrounding, Ray. When all of these hoists are in operation, Ray will be a lively mining camp, and a new and important chapter in the history of the county's mining industry will begin. The companies above named have also asked for bids for the construction of a standard-gauge railroad from Kelvin to Ray, distant seven miles, and this road will be completed at the earliest possible date.—— The Alta Mining Co., at Mineral Hill, is sinking a double-compartment shaft on the dike backing the White carbonate lode. The shaft is about 80 ft. deep, and in the bottom there is a good grade of copper ore, consisting of oxides, glance, and silicates, carrying iron, and some silver. The inclination of the shaft, which follows the dip of the dike, is about 65°. As soon as a depth of 100 ft. is reached in this shaft, a cross-cut to the west will be driven to determine the width of the vein. A new steam-hoist for this shaft, also an air-compressor, and machine-drills, are now on the way from San Francisco.

Phoenix, May 6.

YAVAPAI COUNTY.

Deeds for 62 tracts of placer property have been filed by the Arizona Con. Development Co. This company was formed a year ago to take over 2,500 acres in the Castle Creek, Agua Fria, and Tip Top mining districts, and plans to operate dredges on a large scale. H. W. Hamilton is president, and several Chicago men are interested.

CALIFORNIA.

PLACER COUNTY.

Men are needed in the mining districts of this county. At the Herman mine, as soon as the season opens, 120 men will be employed at the mine and mill and in construction

Map of the New Mining Districts of Nevada and California.

work.——About 10 men are working on the Home Ticket channel.——A tunnel is being driven to open the lower end of the channel, at El Dorado mine.——A big cave has closed the mouth of the tunnel at the Big Basin property, and no work is being done.——At the Glenn mine, above Bald Mtn., Robert Jones is running a bedrock tunnel.——The Eclipse mine is pumped out to the 400-ft. level, at which point a drift will be run to the east.——About 30 men are employed at the Three Stars, and the shaft is down 1,200 ft. Stoping will soon start.

SIERRA COUNTY.

(Special Correspondence).—The Brandy City Mining Co. has the wagon bridge at Indian Valley nearly completed and will soon put on a large force of men to complete it from that place to the mine.——John Costa has started a raise from the face of the lower adit at the White Bear, to strike the Excelsior channel.——The Telegraph company is preparing to re-build the mill that the snowslide struck last winter.——C. J. York is running the new mill at the

Downieville foundry, on ore from the Mexican mine.—— The mill at the Papoose will be ready to start on May 10. ——Buckingham & Girard are preparing to start their mill on the Elsey mine.——The Sovereign has a crew of 12 men at work completing the road that was begun last fall to connect the mine with Sierra City.——At the Sierra Buttes they have hung up the 40-stamp mill on account of a breakage of the tram rope. A new rope is on the way and the mill will start as soon as it is installed. They are running the 20-stamp at No. 7.——The Hoyse Consolidated Co. has resumed work on the new mill and will have it ready to run about August 1.

Downieville, May 3.

TUOLUMNE COUNTY.

(Special Correspondence).—Another rich strike has just been made at the Soulsby mine, this time on the 600-ft. level. Work has been in progress on this level for a long time without any success, and it was not until the original plans were abandoned and a new course taken that the rich shoot was found. Recently a valuable strike was made on the 200-ft. level. From the workings of the Davidson shaft a cross-cut is being driven at a depth of 500 ft. to tap the Wheal Perrin vein, about 350 ft. distant. A crew of 75 men is at present employed at the Soulsby.—— Work of erecting a 10-stamp mill at the Garfield mine, the property of the Floyd M. Co., near Tuolumne, will be commenced this week. The mill, hoist, and compressor will be operated by water-power. It is believed that the property will be equipped with all necessary machinery, and in active operation by July 15.—— A body of good-grade ore has been uncovered in the south drift of the 200 level at the North Star mine. The rock shows free gold, and it is believed the body of ore is a large one.—— Extensive preparations are being made for operating the Ellen Winton mine. The stamp-mill will soon be under construction, and a boarding-house and other buildings are nearing completion.—— The Kanaka mine will be in active operation soon. The manager, Samuel Harris, of San Francisco, arrived last week, and will hasten the work of equipping the property with some new machinery, and of erecting necessary buildings. There is said to be ample capital for the contemplated improvements and development of the mine.—— A new body of high-grade ore has been found at the Mohican, southeast of Tuolumne. The strike was made in an adit being driven above the old one. The vein is three feet wide. It is understood that the crew of four men will soon be increased, and that the mill will be in operation.——The Spring Gulch mine, southeast of Tuolumne, is being unwatered for the purpose of inspection by prospective buyers.—— A rich shoot of ore was uncovered a few days ago in the Blue Lead mine, near Arastraville, after extending the adit only two feet from the point where the former operators ceased work. The property is being worked under bond by R. W. Roberts, R. H. Rowe, and W. Fowles, who have already extracted 15 tons of the newly found ore, which they say will go $100 per ton.—— The strike recently made below the 1,800-ft. level in the Eagle-Shawmut mine, at Jacksonville, is said to surpass all previous strikes at that property. Simon Goudge has superseded James Riley as foreman.—— Sinking is the principal work in progress at the Clio mine, and the shaft is rapidly increasing in depth.—— The Imperial mine, recently bonded to San Diego people, will be equipped with a mill in the near future. Sinking is now in progress.

Tuolumne, May 6.

COLORADO.

GILPIN COUNTY.

The quarterly report of the Pewabic company states that the Pewabic shaft has reached a depth of 700 ft., at which point sinking was stopped on account of a very heavy flow of water. Drifts have been driven from this point east and west. The development work done consists in 830 ft. of driving, 35 ft. of sinking, and 460 ft. of raising, during the quarter.——The Ipava shaft of the Lotus group in Russell gulch, which is owned by the Sternberger Bros., is being sunk. It is already 175 ft. deep, and good ore has been opened. Connections are to be made with the Columbus workings, and thus the Ipava workings will eventually be connected with the Lotus. Fred Wood is in charge of operations.——About 25 lessees are at work on the East Notaway property of the Town Topics Gold Mining Co. Martin & Co. have opened the ore-shoot in the 655-ft. level on the west side of the shaft, and are shipping copper ore.

PITKIN COUNTY.

A deep tunnel is being planned to open and drain some of the old producers to Aspen. D. R. C. Brown and Charles J. Hughes are interested in the project and it is planned to expend one million dollars in the work.——A group of Michigan capitalists is interested in the Sandy Hook Mining Co., operating on Ohio creek, near the old Chronicle property. A tunnel will be run to develop the property.

SAN JUAN COUNTY.

The Bagily tunnel is in nearly 4,000 ft. and 10 ft. per day is being made toward the Mineral Point country. The electric drills have been discarded and Sullivan sluggers are doing the work.——The mill of the Hercules Consolidated company has started with a capacity of 150 tons per day. A large ore reserve has been blocked out in the four miles of tunnels and drifts.——The new machinery installed in the Hamlet mill is working satisfactorily and the mill is handling 75 tons of ore per day. There are four tunnels on the property.——The Mogul mill at Gladstone is still idle, on account of delay in the delivery of machinery.——The lower tunnel at the Auburn property, on Tower Mtn., is in 800 ft. and will be continued 1,[illegible] ft. farther. A power-line will be built to the Animas Power Co.'s line, and the compressor will be run by electricity.——The [illegible]ing Co.'s Champion property, on Sultan Mtn. [illegible]g well. A shaft has been started in the lower level to connect with the tunnel that is being run from [illegible] the Animas river, a distance of 500 ft. This company's Silver Wing mine, above Eureka, shipped eight cars of high-grade ore to the Ross smelter at Silverton, last month.

SUMMIT COUNTY.

(Special Correspondence).—The Stearns-Rogers Mfg. Co. recently shipped two cars of machinery from their Denver warehouse to the King Solomon T. & D. Co. for the new power-plant of that company. The machinery consists of an Ingersoll-Sergeant compressor built to operate at an elevation of 10,000 ft., with compound air and steam cylinders; a receiver 4 by 16 ft.; a 100-ft. smoke-stack, together with pipes, valves, and connections, etc., necessary for the complete setting of the plant. Several days ago the same company shipped from an Eastern warehouse a 163-h.p. Heine water-tube boiler. F. C. Dinsmore has been at the mine for the last 10 days making preparations to install this machinery as soon as it should arrive. The concrete foundations are in place and three cars of lumber, brick, and cement have been unloaded at the plant. The power-house is being enlarged and new coal-sheds built. No money is being spared to make this plant the most efficient, modern, and up-to-date in the district. This mine has been one of the most active in Summit county for the last two years. Operations have been continuous day and night and the cross-cut tunnel has been advanced to the 1,400-ft. mark. Having now reached the point where the former power-plant was inadequate to do the work at the greatest possible speed combined with economy, it was voted at a directors' meeting to install the above-described plant as early as possible in the spring.——As soon as the new plant is ready for operation, two 3½-in. drills will be put in the breast of the tunnel and the big bore advanced with all possible speed. This company owns extensive properties situated in the Ten Mile range near Frisco. These properties are being developed by a big cross-cut tunnel which enters the mountain about a mile up the Ten Mile cañon from Frisco, and a little above the tracks of the C. & S. railroad. At this point depth is gained rapidly until at the steepest point a depth of over half a mile is gained. Already six veins, carrying gold, silver, and copper, have been opened.

Denver, May 4.

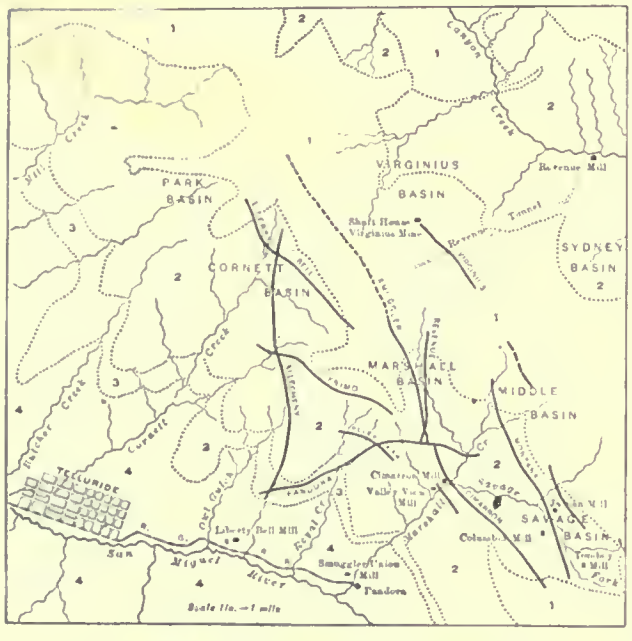
IDAHO.

BLAINE COUNTY.

The mining outlook in the vicinity of Hailey is more promising than ever before. The Idaho Consolidated company, which has added the Minnie Moore to its holdings on the galena belt, is equipping its properties with electrical machinery, and preparing to start the mill working on the old tailing dump. A shaft is being sunk on the property and the company should be on a solidly producing basis within a few months.——The Croesus has again resumed shipments and has developed ore carrying gold, silver, copper, and lead.——The Ophir, Bullion, Mayflower, Fraction, and Jay Gould properties will be re-opened by Tustin & George. They will be tapped by an extension of the Durango tunnel.——The Eureka mill is expected to produce concentrate without interruption.——A good body of ore has been developed on the Red Elephant group of the Quincy Junior company, which will keep the mill running indefinitely. ——The Nay Aug, on Deer creek, has developed good shipping ore, in addition to second-class ore.

OWYHEE COUNTY.

The Burgh mine, near Rooster Comb, 15 miles from Silver City, is said to be looking well, and the five-stamp mill is running continuously.——A strike is reported in the Miller & Walter mine on Florida Mtn.——At the Potosi mine, development continues on the No. 2 level, both in the south drift, which is now in 230-ft., and in the raise north of the Knickerbocker shaft, which is up about 30 feet.



Sketch Map of Telluride District, Colorado.

SHOSHONE COUNTY.

(Special Correspondence).—Five mines, operated by the Federal M. & S. Co. in the Coeur d'Alene, netted profits of $2,685,213.76 in 1906, according to a statement filed with the assessor of this county. Improvements made at the properties, the Standard and Mammouth at Mace, the Morning at Mullan, the Last Chance at Wardner and the Tiger-Poorman at Burke, cost $118,873.82. The gross tonnage extracted was 933,557, yielding a gross value of $7,775,770, from which is deducted the cost of production, $2,755,867.75, and cost of transportation and reduction, $2,215,814.67. The Standard was the largest producer, the tonnage being 334,403, yielding $3,969,941.46 gross or a net profit of $1,912,575.92; the Last Chance produced 168,608 tons, $680,874.70 gross or $80,439.10 net profit, while the Morning shows 313,070 tons, $1,651,441.44 gross or $255,237.78 net profit. The statement shows substantial increases over 1905, when the total number of tons of ore extracted from all the Federal mines amounted to 905,004, yielding $5,962,385.59. The cost of the extraction of the ore amounted to $2,357,497.62; reduction and transportation, $1,950,421.17; improvements, $89,248.47, leaving net profits of $1,565,218.33.——Work has been resumed upon the Gettysburg-Independence mine at Mullan, where Kennedy Hanley, the owner, has let a contract to drive the cross-cut tunnel 600 ft. farther to encounter the Morning vein. The mine has been idle four years. Mr. Hanley has expended $70,000 in buying outstanding titles to nine claims comprising the group, in the last four months. He has also spent $60,000 in developing the property, and has installed a compressor and a motor, operated with power from Spokane. The tunnel has been extended to 1,400 ft. When the vein in the Morning is encountered in the Hanley property it will be of a depth of between 700 and 800 ft. In the Federal property the vein has been opened at a depth of 2,000 ft. It is figured that it will require three months' work before the ore-shoot is encountered. C. B. Boyden is superintendent of the mine. ——Through J. A. Jackson, representing capitalists at Denver, Colo., an offer of six cents per share has been made for the control of the Crater and Big Medicine groups, silver-lead propertios, in the Coeur d'Alene. Each of the groups is capitalized for 1,500,000 shares. It is the intention of the Denver men, if they acquire the control of the properties, to consolidate them upon the basis of share for share. If the deal is consummated, approximately $100,000 will be paid for the control of the two groups. The Big Medicine group adjoins the Cedar Creek properties, while the Crater adjoins the Big Medicine, the C. & R., the Happy Day, the Majestic and the Phoenix. Neither group has been developed, but the surface showings of both are said to be excellent. A contract was recently let for a tunnel on the Crater.—— The Oom Paul Con. Mining Co. and the owners of the Lady Bell mining claims have consolidated with increased capital, at Wallace. The new company is capitalized for $1,600,000, the incorporators being: F. C. Richardson and F. H. Richardson of Burke, P. F. Smith and James F. McCarthy of Wallace and Walter McKay of Portland. The Oom Paul company is the owner of the Williams, Day, Western, McComas, Caribou, Forget-Me-Not, Portland, Snowshoe, and Evening Star claims. The Lady Bell claim was until recently owned by Richard Wilson and Walter McKay of Portland, and James Leonard, George W. Ruggles, and James F. McCarthy of Wallace. The Lady Bell claim has been paid for in stock of the new corporation. It is believed that the Oom Paul ore-shoot crosses the claim. ——A. Herman, president of the East Snowstorm Mining Co., reports that the No. 2 tunnel is in 240 ft. At 200 ft., a cross-cut was driven for 31 ft., showing vein matter along the wall. The hanging wall has not yet been encountered.—— F. A. Heinze, who recently acquired extensive mining interests in the Coeur d'Alene, is figuring upon the purchase of the O. K. Consolidated, the Black Hawk, and the Wyoming groups, which adjoin the ground of the Coeur d'Alene D Co., which is under bond to him.——Directors of the Merrimac Mining Co. at Wallace elected these officers: President, W. W. Woods; secretary and treasurer, Charles H. Bell. C. H. Bell was appointed manager for the company. The company was recently incorporated with the object of developing seven claims on the Polaris and Big Creek gulches in the Evolution mining district and adjoining the properties of the Polaris and Yankee mining companies. Buildings will be erected and a force of men set at work in a short time.

Spokane, May 4.

MONTANA.

GRANT COUNTY.

The old St. Louis & Montana company, which became the Goodhope company, has been reorganized a second time, under the name of the Hope Mining Co. The property owned by the company has been operated since 1867, and has yielded good dividends. An air-compressor is now being installed at the mine and power-drills will be used in all the principal workings.——At the property owned by George S. Congdon and Frank M. Kent, near Lookout Mtn. on Rock creek, the tunnel is in over 1,300 ft., and the vein will soon be cut.——The Mountain Ram group of claims, 12 miles southwest of Philipsburg, has been sold to men at Colorado Springs. A 100-ton cyanide plant will be erected. ——An option on 45% of the stock of the Twin Buttes company has been given to Eastern people.

NEVADA.

WHITE PINE COUNTY.

The railroad that will carry ore from the Alpha shaft of the Giroux Consolidated Co. to the concentrator at Kimberley is about completed. A large force of men is working on the big fill, back of the Morris shaft, which will complete the work. The concentrator is nearly finished, the walls are up and the roof about done.——The Biscuit company is loading cars with silver ore from the Tea Cup mine at Cherry Creek.——A copper strike is reported in the Joe Moore shaft at Dolly Varden, at a depth of 115 ft.——Two steam-shovels are working on the foundation excavation for the concentrator at McGill, a third is on the ground, and a fourth is expected to arrive in a few days.——A churn-drill has been put to work on the Veteran claim of the Cumberland-Ely company.——The Chief of the Hills property in the Cherry Creek district has been sold by F. M. McDermid to J. W. Walker and Alfred Fletcher. The purchasers agree to sink a 700-ft. shaft at once, and a 40-h.p. gasoline hoist will be installed.——The Ely Consolidated company has ordered a 25-h.p. hoist for the Brilliant shaft. The small hoist now at the Brilliant will be transferred to the Famous claim, where a new shaft has been started.

OREGON.

BAKER COUNTY.

The Daines M. & M. Co. of Spokane, operating in the Greenhorn camp of eastern Oregon, has started mills on two properties. Two new mills will be installed this year. One of these, a 10-stamp mill, will be hauled into the camp soon. The other will be running before the season is over. ——Miners working on the long tunnel from the shaft of the Midway, in the Golconda district in eastern Oregon, at 300-ft. depth, broke into the main vein for which they were driving, at a point 271 ft. from where they started. They have since cut through it and find it 10 ft. wide.

GRANT COUNTY.

Shareholders of the North American Copper Co. have recently visited the property. This company has made final payment upon the Nelly Bly property, upon which sinking has progressed to a depth of 50 ft. The shaft of the Snake mine has been re-opened to the 500-ft. level, and retimbering is being done.——A good strike is reported in the Burro Mtn. district, on the property of the Burro Mountain Copper Co., at Leopold. This company drove 200 ft. and then started a cross-cut, which is now 150 ft. long and shows good sulphide ore.

LANE COUNTY.

The Oregon Securities Co.'s properties, which have been in litigation for some time, have been sold at auction to John W. Wheeler for $100,000. A new company will be organized, and the properties operated.——The sale of the Grizzly mine in Bohemia, to an English company, is being negotiated.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—The Clara Belle Mining Co. is working a full force on the 250-ft. level in the new shaft, and is driving east to catch the orebody that was left in the old inclined shaft. Frank Hebert, the superintendent, says that although they have cut through a large body of good milling ore, it is not the vein of high-grade quartz that they were seeking.——The Old Bullion mine has been bonded to A. R. Roosevelt of New York and a mill will probably be erected during the summer. The mine is fairly well developed with one adit 400 ft. and another 200 ft. in the mountain, while a shaft has been sunk from the apex to a depth of 200 ft. These openings are all in the vein, which carries sulphides and is represented to be very wide The ore averages $6 per ton in gold, and is amenable to the cyanide process. The option was secured through Sam Boylson of Keystone, where the mine is situated.——The difficulty which has existed for several weeks past between the Holy Terror Keystone Co. and C. F. Collins, the former superintendent, has been settled, by Mr. Collins surrendering the books and list of stockholders to the attorney for the company, W. A. Babson. It is announced that the Holy Terror mill will now be put in order and started up May 10.——The Crown mine, situated in the Hornblende district west of Rochford, has been sold to an Eastern syndicate that will immediately start work. This property belonged to James McNickle and has always been represented as a free-milling proposition.——The Golden West mine, also in the Hornblende district, is running steadily with two eight-hour shifts; the showing on the plates is excellent, and there is a large vein.——The Ideal Mining Co., whose ground is situated about seven miles northeast from Custer, is running an adit into the mountain to strike the vein which was exposed at the surface. They are also grading a wagon-road and excavating for foundations for the new air-compressor which is on the ground. A. Conover is in charge.——The mining camps in the Southern Black Hills have never looked more prosperous than they do at present, and everyone looks forward to a profitable season.

Custer, May 3.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—A stampede to Chelan Butte and the location of a number of claims have resulted from the discovery of goldbearing quartz.

Republic, May 3.

FERRY COUNTY.

(Special Correspondence).—The Blue Bell-Belcher Mining Co. has appointed Wm. Woodward superintendent, and will resume work immediately on an adit, now in 110 ft., and drive it to cut the northerly extension of the Belcher vein in its own ground, at a probable farther distance of 100 ft. The ore is iron sulphide; it carries gold, and shows indications of copper.

Republic, May 3.

SPOKANE COUNTY.

(Special Correspondence).—Spokane newspapers having reported the discovery of tin ore on Moran prairie, six miles east of Spokane city limits, in which R. Marsh, Charles P. Robbins, and Charles Theis are interested, your correspondent wrote Mr. Robbins, formerly of Eureka, Nevada, for information. He replied, sending specimens of tin oxide, in quartz gangue, with the following information: "Last May the Spokane newspapers reported that Dayton Stewart had found a lead mine on Moran prairie, and he and Mr. Marsh went to the designated place and found float in a gulch, which the former, a Spokane assayer, tested, and found the rock contained tin. They tried to negotiate for an interest, but were unsuccessful. Mr. Stewart bonded his claims to Patrick Clark, who had some work done, but the result was not satisfactory, and the bond was thrown up. Messrs. Marsh, Robbins, and Theis subsequently acquired title to the ground, and bonded adjoining property. The claims are on patented land, in the midst of orchards. From the description given, they are situated on a zone of greisen and granitic schist, with metallic ores cropping out in places. The present owners, about March 1, began exploiting the ground, and are employing seven men. Very little is known at present as to the vein system, but the ore-bearing strata strike up a hillside, the apex of which is about 200 ft. above the track of the Spokane & Inland Electric railway. The zone referred to is 750 ft. long and 500 ft. wide. What have been regarded as the veins are from 10 to 50 ft. wide, and trend northeast-southwest. On the most westerly stratum of ore an open-cut has been driven 50 ft., with the face 20 ft. deep. Other prospecting work is being done on smaller streaks. Along the last 25 ft. the ore will concentrate to 10%. The face of the cut was eight feet wide in good ore. The concentrate will yield 70% tin. On the hanging-wall side of the pay-streak is lower-grade mineral, and on the foot-wall is a six-inch streak of wolframite and scheelite. I have been told that the discovery of tin ore on Moran prairie was reported 20 years ago, and a great excitement was caused in Walla Walla county, in the southern part of Washington, when the discovery of tin ore on what was known as the Mill creek slopes, 12 miles east of the town of Walla Walla, was reported, and a number of people rushed to the slopes and staked claims, but no development work was done."

Republic, May 3.

BRITISH COLUMBIA.

The trouble with the coal miners of western British Columbia and Alberta curtailed the production of ore in British Columbia for the week ending April 27. During that week the following is the tonnage of the ore shipped from the Rossland mines: Centre Star, 1,020; Le Roi, 1,785; Le Roi No. 2, 350; and White Bear, 70 tons of ore.——The main shaft of the Centre Star is now 100 ft. below the 14th level, and work in it has stopped until skips and track have been moved down to that level from the No. 12 level. Develop- [illegible] is making good progress, and [illegible] tre Star gulch into the Idaho [illegible] tation of the new hoist at the [illegible] as rapidly as possible, and it [illegible] 15.——The new machinery [illegible] and Empire soon, and prepa- [illegible] omplete.——Only 963 tons of [illegible] ek at the Trail smelter. Be- [illegible] Rossland mines, other ship- [illegible] Phœnix, 847; St. Eugene, [illegible] 22; Providence, Phœnix, 27; [illegible] 50; Iron Mask, Kamloops,

Map of Part of British Columbia.

33; Silver King, Nelson, 41; Last Chance, 20 tons of ore.—— The Northport smelter continues to operate on Le Roi ore. A fair supply of coke is on hand, and the plant can be kept in operation until shipments of fuel are resumed from the Crow's Nest Coal Co.'s ovens.

The Boundary shipments for the week ending April 27 were as follows: To Granby smelter, from Granby mines, 14,449; to B. C. Copper Co.'s smelter from Mother Lode, 6,640; from Morrison, 60; from Snowshoe, 3,970; from Emma, 220 tons of ore. To Dominion Copper Co.'s smelter, from Brooklyn, 96; from Sunset, 256; from Mountain Rose, 32 tons of ore. Total shipments for the week, 25,723. The Boundary smelters treated ore as follows: Granby, 15,003; B. C. Copper Co.'s plant, 9,355; Dominion Copper Co.'s plant, 384 tons. Total treatment for the week, 24,742 tons of ore.——The Fernie coal miners and operators have drawn up an agreement to cover a period of two years. This means the immediate resumption of work in the district.

MEXICO.

GUERRERO.

(Special Correspondence).—The Mitchell Mining Co. has just been advised that an additional shipment of 500,000 ft. of ties and timber has left Seattle, consigned to La Dicha & Pacific railroad at Port Marques, on the Pacific Coast, Mexico. All the rails for the railroad at La Dicha will go forward on a fast steampship from Belgium on or about May 4. The work will be pushed with all possible speed looking to the completion of the road from the mines to the coast, this fall. George Mitchell, president of the company, announces that the contract has been given out for three locomotives and a large number of cars. One locomotive and fifteen cars have been ordered to be shipped at once from San Francisco, to be used on the construction work About 850 men are at work grading at the coast end of the line.

JALISCO.

The United States consul-general at Mexico City estimates that in the last four years $125,000,000 of American capital has been invested in mines in Mexico. Guanajuato leads with $12,000,000 and Jalisco and Oaxaca are next with $10,000,000 each.——Machinery for the old Cuartas mines in Bautista camp of Jalisco, has been shipped from the States and will reach Ameca early in May. The equipment includes a four-drill compressor, a steam-hoist with a capacity of 800 ft. in depth, and a Cameron sinker with a capacity of 250 gal. per min. This company is a Chicago organization, with Harry M. McIntosh president and William A. Lees general manager.——A bonanza shoot has been opened in the property of Los Reyes Mining Co., of Guadalajara.——It is reported from Ezatlán that 17 ft. of rich ore has been struck on the 1,050-ft. level of the Amparo mine.——The Makeever Brothers have just closed a deal to re-open the Real Alto and San Sebastian camps of Jalisco. The old Tajo mine, has been purchased and options covering the other old mines have been secured. The plans include the erection of a hydro-electric plant to utilize the water of Los Reyes river, and the erection of a mill. These properties are two days' journey from San Marcos, the nearest railroad point. L. C. Malone will be in charge of the work.——The San Domingo Mining Co. has ordered the purchase of 100 mules to use in transporting high-grade ore from the mines to the Mexican Central station at Etzatlán. Rich strikes are reported in the Rayas and El Favor claims. Air-drilling machinery will be purchased at once for this property.——The boom in tin mining in the Paso de Sotos district of Jalisco, adjoining the State of Aguascalientes, has entirely subsided.——The Lupita mines in the Mascota district have been shut down. The manager, Patrick Fitzgerald, stated that it had been decided to stop mining and milling operations indefinitely. These mines have been steady producers for several years, and were regarded as important properties.

SONORA.

The new No. 2 furnace at Cananea has been blown in. The two new furnaces have a capacity equal to the combined capacity of six of the old furnaces that they replaced. Another new furnace will be finished in about six weeks.

NOVA SCOTIA.

(Special Correspondence).—During the last few months, so many enquiries have been made to the Government about Nova Scotia gold, iron, and coal mines, that the Government has decided at the request of many interested parties in the States, to have a first-class mineral exhibit at the Jamestown Exposition.——Not only are the foreign capitalists that have lately become interested in Nova Scotia mines urging the desirability of such an exhibit, but the local people are very much in favor of such an exhibition. There is ample material at hand from the numerous mines. There are in this Province some of the biggest bituminous coal mines in the world. In fact, the biggest unbroken vein of bituminous coal ever opened was opened in one of the Allan shafts of the Arcadie Coal Co. We have iron mines that are proving of great economic value. We have gold mines that have been proved.——The Londonderry and Torbrook mines will be well represented. The principal gold mines, such as Micmac, Boston & Richardson, and the dozens of other districts, will be well represented.—— There has been such a decided step forward in the scientific development of Nova Scotia mines that the Province is rapidly coming forward as a valuable mineral-producing section.

Bridgewater, April 30.

Special Correspondence.

London.

Cornish Consols.—Cheerful Meeting.—Sound Finance.—West Australian Companies. — Golden Horseshoe. — Great Fingall.—Ivanhoe.—Interesting Details of Accounts.—Shrinkage in Australian Mining Shares.

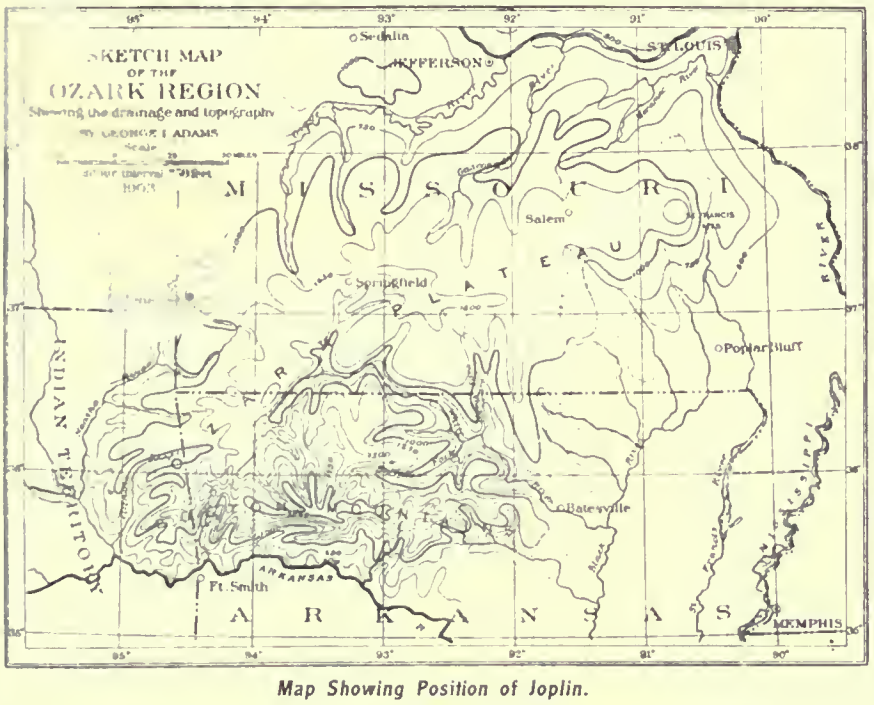
The report of the directors of Cornish Consolidated submitted at the first general meetiug was of a highly satisfactory nature. The Chairman accentuated its good points in a crisp and lucid speech of an inspiriting character, plainly showing that Cornish Consols lacks neither the means nor the ability for the establishment of a mining business on sound and at the same time up-to-date lines. This can be abundantly proved from whatever aspect the Company's doings and position may be considered. Take, for example, the manner of dealing with the accounts; the conservative policy of the directors is apparent in the fact that the charge for preliminary expenses—the outlay in the formation of the company, often spread over a considerable period—is entirely written off to the first year's revenue account. Then the valuation of the assets has been fixed in a way to preclude the risk of paying dividends out of capital. The Company holds a large number of shares in South Crofty; these are set out in the balance sheet at par, while the present market price is more than three times the nominal value. Speaking of this mine in his address, the Chairman described it as a splendid enterprise. Rapid progress has been made at South Crofty both at surface and underground. A modern battery of 40 stamps is well advanced in construction; the first 20 heads will start this month and the second 20 at the end of June. The Chairman said he thought it was not likely they would stop at 40 stamps; at the end of the year they would probably see 60 at South Crofty; and the question as to how soon they might have 80 stamps is only limited by the water-supply. The manager has committed himself to the extent of saying that he has five years ore ahead of his mill. Difficulties have arisen with the magnetic separation; but it will only be a week or two before matters are put right. South Phœnix, at Liskeard, is owned entirely by Cornish Consols. The mine is unwatered and the battery will be running early in the autumn. A plant is being put up by Cornish Consols at South Phœnix; to a certain extent they are making it an experimental mine; so that in their bigger mines they will avoid experimental working. Anything worth a good trial will be sent to the South Phœnix and most exhaustively tried; so that if the results are satisfactory the improved appliances will be employed at other mines. In addition to these investments Cornish Consols holds interests in several other mines, with some £25,000 cash in hand after paying dividends. Incidentally the labor question was touched upon at the meeting. It transpired that with about 1,000 men in their employ the managers have had no difficulty on that score, in spite of the rule, strictly enforced, of working full time, instead of 18 days in the month as customary in many of the other mines in Cornwall.

Three of the leading Western Australian gold mines have issued their annual reports for 1906. In the case of the Golden Horseshoe, after being debited with £25,703 for development expenses, with £23,708 for plant and machinery, and with £14,679 for income tax and Australian duty tax, the revenue account shows a balance of £248,816. To this has to be added £56,906 brought forward, making a total of £305,722. After certain adjustments, and £240,000 paid in respect of two dividends of 5s. and one dividend of 6s. per share, a balance is carried forward of £61,599. During the twelve months 237,294 tons (2,240 lb.) of ore have been sent to the mills, yielding 38,825 oz. fine gold, of a net value of £165,173. Of residue 34,632 tons have been treated by the cyanide process, yielding 11,996 oz. worth £51,126. Of slime 193,449 tons have been treated in the filter-presses, yielding £55,883 oz. worth £237,948. Of concentrate 4,239 tons have been treated by the roasters, yielding 12,660 oz. worth £53,919. Of residue 14,695 tons have been re-treated, yielding 2,714 oz. worth £11,520. Of sulphide ore and concentrate 9,714 tons were sold to the smelters, which realized £87,695. The total net value of bullion realized and in transit to December 31, 1906, amounted to £607,383. After treating 243,026 tons during the year, there were in sight at December 31 practically 1,000,000 tons of ore, valued at £2,889,944. The extraction (excluding gold from re-treatment of tailing) was 87.81% and the average value per ton £2.12.9. The total cost per ton, including mine development, shaft-sinking, and diamond-drilling, amounts to £1.8.10, as against £1.11.3 for 1905, which shows a reduction of nearly 2s. 6d. per ton.

According to the report of the general managers of the Great Fingall Consolidated, development work has been vigorously carried on during the year, a total of 8,230 ft. having been done. The main shaft is now 1,611 ft. deep. A large amount of exploratory work was done during the year. The total expenditure upon development was £39,037, the whole of which has been charged against revenue. The tonnage treated during the year was 249,646 tons, being an increase of 46,329 tons over the previous year, with the same number of stamps, such increase being chiefly due to the installation of the re-grinding plant. The power, air-compressor, and mill-plants have required some expansion during the year to provide for this increased tonnage. The 249,646 tons treated produced 121,502 oz. fine gold, having a value of £518,657. The working expenses, including development, averaged 19s. 11d. per ton, as compared with 19s. 9d. the previous year. After writing off £5,516 for depreciation of machinery, plant, etc., a net profit of £233,386 has been realized. This, with the balance of £125,699 brought forward from last year, made a total of £359,085, out of which sum four interim quarterly dividends have been paid, amounting in all to £275,000, leaving a balance of £84,085 at December 31. Out of this amount a further dividend was paid on January 10, 1907, amounting to £37,500, leaving a balance of £46,585 in hand.

The report of the Ivanhoe Gold Corporation for 1906 states that, after making provision for every description of expenditure, there is a profit of £259,281. Including the net balance from 1905 of £829, there is a total credit of £260,111. Interim dividends have absorbed £107,861, and the directors now recommend payment, on April 25, of a fourth and final dividend for 1906 of 9s. per share, (making 24s. per share, or £240,000 for the year). Directors' remuneration absorbs £1,350, and general reserve £10,000, leaving £6,511 to be carried forward. Further equipment has been provided during the year, and the expenditure thereon, amounting to £12,889, has been included in the ordinary monthly costs, and, with the expenditure on mine development, £42,224, making a total of £55,113, has been written off. The total expenditure on these items since the formation of the company, amounting to £692,428, stands in the balance sheet at £54,295, the amount of the company's original working capital. The working costs have been further

reduced during the year to 18s. 10d. per ton, while the total West Australian costs, including the entire expenditure on mine development, buildings, plant, and machinery, work out at 24s. 2d. per ton. The following shows the working costs per ton of 2,000 lb. during the last five years: 1902, £1 7s. 1d.; 1903, £1 3s. 4d.; 1904, £1 1s. 3d.; 1905, 19s. 5d.; 1906, 18s. 10d.; 1907 (first quarter), 17s. 8d. The total dividends distributed in the company's existence will, upon payment of the dividend now recommended, amount to £1,750,000. During the year 208,304 tons of ore were crushed, showing a duty of 5.9 tons per stamp, recovering gold to the value of £149,955, at a total cost of 8s. 1.87d. per ton. The increase in tonnage over 1905 is 11,735, and is mostly due to the additional quantity of water made available by a new pump. During the last three months of the year when this pump was running, the duty per stamp was 6.33 tons, through the usual punched screens. The schedule of ore reserves shows 932,551 tons, containing £... 39,838, an average of 54s. 5d., against 59s. 4d. per ton for 1905, the increase in tonnage being 163,491 tons.



Map Showing Position of Joplin.

No ore has been taken into reserves lower than the 1,371-ft. level, as, in the manager's opinion, the 1,519-ft. level has not been opened up sufficiently to justify an estimate.

Zinc Corporations and Lodden Valley, although slightly better, are still a weak market. Writing to a shareholder on April 11, the London secretary of the Zinc Corporation is reported to have said: "The directors feel confident as to the ultimate success of the company, and are advised that the question of the treatment of the tailing is absolutely solved by the Cattermole process. As soon as a fair run of tailing through this process has taken place, no doubt we shall be supplied with details as to the results being obtained." Commenting on the huge losses in market values of the 34 representative Australasian mines comprised in its monthly table of comparative values, the *Australasian World* says they cannot but be regarded as serious. Between March 11 and April 8 there was a gross shrinkage in values of £2,422,562 — a fact which is a severe reminder that the Australasian mining market is extremely sensitive. What occurred during the period to occasion such a serious fall is past history. The truth is that the American collapse depressed every department of the Stock Exchange.

Joplin, Missouri.

Shipments of Ore. — Market Weakening. — Discovery on Indian Land. — New Mills. — Granby Co.'s New Shaft. — Sale of Property. — Scarcity of Experienced Labor.

The highest price reported paid for zinc ore for the week ending April 20 and also for the week ending April 27 was $52 per ton; $82 per ton for lead ore was the high price for both weeks. The high price for zinc ore a year ago was $45 and for lead ore $78 per ton. The market seems to have a downward tendency and purchasing is easy for the agents.

Shipments	Zinc. Lb.	Lead. Lb.	Combined Value.
Week of April 20	12,259,980	1,962,900	$ 376,799
Week of April 27	12,187,660	1,963,460	366,441
Year to date	201,943,780	31,845,280	6,167,348
Last year	168,791,720	23,849,800	4,604,953
Increase	36,152,060	7,995,480	562,395

A drill on the Baxter Royalty Co.'s land, in the main street of the town of Quapaw, found a rich deposit of zinc ore from 138 to 151 ft. The town of Quapaw is named after John Quapaw, a former chief of the Indian tribe that owns the land. The well was drilled for the purpose of supplying water for the inhabitants, and the ore encountered is said to be the richest yet found in the many strikes made in that part of the Indian Territory.

The frame-work for the new 500-ton mill of the Deacon mine, owned by the Trinity Zinc, Lead, & Smelting Co., on the south end of the 120-acre lease in the Duenweg district, is up, and the work of completing it is being pushed as rapidly as possible. It is to be equipped with all the latest improvements in mill construction, making it first-class in every particular. Just across the road to the south of the Deacon mill, Mattes Bros., of Joplin, have just completed and started the big 500-ton San Gabriel mill.

For several years the Granby Mining & Smelting Co. has had drills at work over its land exploring the lower ore measures, never mined, and only within recent years known to exist. The company has selected a site where the heaviest portions of the lower ore vein is apparently massed, and will here sink a large shaft to test the drill-records of the surrounding holes. Care has been made in the selection of the site to avoid underground waterways, and the shaft is placed where no surface water will be drawn into it.

James Radley and Frank Blain, of Joplin, have been working a four-lot lease on the old Charter Oak, in the south edge of Carterville, for several months, and succeeded in opening up a splendid vein of ore in the sheet formation at a depth of 150 ft. They had a 12-ft. face of ore, and of good grade. Last week they disposed of the property to Judge Pfost, of Kansas City, for a neat figure, and a 200-ton mill will be erected at once.

The starting up of a number of new mills would seem to indicate an increased output; on the contrary, it is having the opposite effect. This is due to the division of good workmen. Hardly a mine or mill in the district is now equipped with a full force of experienced men. The starting of so many new mills has called some experienced men from other mines and mills, leaving them crippled, while the new mill, being only partly supplied with

experienced men, is incapable of doing full duty. A few operators are paying a big premium for experienced workmen, and these are making record runs, while many others have fallen down because they could not afford to meet the higher prices for labor, and their output is lessened, not because the mine is less productive, but because the higher price for experienced men has reached a prohibitive stage.

Butte, Montana.

B. B. Thayer Reports Favorably.—New Mining Companies.—Barnes-King Consolidation.—Davis-Daly Estates.—Deepening the Anaconda Shafts.—Good Results From Deepest Level.

B. B. Thayer, assistant to H. H. Rogers, president of the Amalgamated Copper Co., has made an examination of all the mines, smelters, and associated industries of the Amalgamated, North Butte, and Butte Coalition companies in Montana, and he reports them in excellent condition. He said: "I have examined all the mines and have found greater orebodies blocked out and conditions generally better than last year, or at any time in the past. All the ore is being hoisted from the Amalgamated mines that the Washoe and Great Falls smelters can treat. With increased smelter facilities it will be an easy matter to provide the ore. Shafts are being sunk and development is going on without interruption. In the Anaconda mine we shall soon begin stoping the enormous orebody struck on the 2,400-ft. level. The only ore so far taken from the lower level was removed while development work was in progress. It is an immense body. In the meantime the shaft of the Anaconda is being lowered and eventually we shall find out what we have at a still lower depth."

Two new mining companies have been organized and incorporated in Butte. The Butte & Corbin Consolidated Copper Mining Co., with a capital stock of $700,000, will operate in the Corbin district. The directors of the company are J. B. Fitzpatrick, Martin Mulvahill, Lee Williams, and Lee Dever. The Butte & Red Eagle Copper Co. will operate in the Butte district. It is capitalized for $5,000,000, and the directors are J. D. Slemons, Fayette Harrington, James A. Canty, A. A. McMillan, Samuel Barker Jr., John W. Swain, and John D. Haines. The Eagle Mining & Smelting Co. has changed its name to the Copper Eagle Mining & Smelting Co. and has increased its capital stock from 150,000 shares of $1 each to 500,000 shares at 50c. each.

Officials of the Barnes-King Development Co. confirm the report that negotiations are pending for a consolidation of the Barnes-King, Kendall, and North Moccasin companies. If the consolidation is made the two other companies will be absorbed by the Barnes-King. The last has a contract for doing a lot of exploration work in the property of the two other companies, upon which it is now engaged. If the results are good the consolidation will be effected. There is a large mill on the Kendall, which would be an important acquisition itself, as it would do away with the necessity of building an addition to the Barnes-King mill. The properties of the three companies adjoin each other. Recently two large bodies of ore were opened in the North Moccasin. This property is owned principally by John A. Drake, of Chicago. The Kendall property changed hands some time ago for $500,000. The Kendall is valued at about $1,000,000. The Barnes-King Development Co. purchased the Barnes-King mines for $1,200,000.

The cross-cut being driven for the Davis-Daly Estates, south from the 1,800-ft. level of the Original mine, cut through the foot-wall of a vein, believed to be the Thomas, and the rush of water was so great that work had to be suspended. It is expected that work can be resumed in a few days. The vein was found where the engineers calculated the Thomas vein would be encountered, and it also is their estimate that the vein ought to be about 30 ft. wide, carrying good commercial ore. It is the intention of the company to continue the cross-cut a long way farther south, as there are four or five other veins lying in that direction within the Davis-Daly ground. Work at the other properties of the company is making good progress. The new 125-h.p. electric hoist has been installed at the Smokehouse shaft, and sinking has been resumed. The drifts on the 500-ft. level of the Smokehouse have not yet cut any large bodies of ore, as both the east and the west drift have found the vein badly broken. Work is being pushed at the Mt. Moriah, the Silver King, and Plymouth, and the Colorado. The shaft on the last named is nearly 1,000 ft. deep. When it reaches that depth a station will be cut and cross-cuts started north and south for the purpose of exploring the ground.

The Anaconda Co. has decided to sink all of its main shafts several hundred feet deeper at once, and the plan

Montana.

is to continue sinking while copper is high and open as much ground as possible in anticipation of a possible fall in the metal price; so that on a lower market expenditures may be confined to actual mining. All of the big shafts of the company will be sunk to a depth of 3,000 ft. The shaft of the High Ore mine is already 2,700 ft. deep and sinking is going on rapidly. The company is running levels at every 200 ft., and is now engaged in cross-cutting at the 2,600-ft. level of the High Ore. It is also developing the vein on the 2,400. In the Anaconda and Never Sweat mines the rich veins on the 2,400-ft. levels are being opened and proving big and strong all through the workings so far made.

The Butte-Montana Co. has ordered a new engine for the Alex Scott mine with a view to sinking the shaft to a depth of 1,500 ft. A station has been cut at 900 ft. and sinking has been resumed. The lowest level in the mine is at the 700, and some ore is being mined by the company on the 600. Good ore is coming from that part of the mine, but not in large quantities, as the vein there is small, though it contains some copper glance and other high-grade ore. The Alex Scott is well located and in the opinion of the management it will be only a question of depth to get big orebodies. The Butte-Montana is also mining some silver ore from the Little Annie mine, a property in the northern part of the Butte district.

Cripple Creek, Colorado.

Strike in the Hoosier.—Successful Leasing.—Rich Ore in the Modoc.—Gold Coin to be Unwatered.— Gold Dollar Production.— The Drainage Adit.—Blue Flag Cyanide Mill.

A strike is reported in the Hoosier mine, on Tenderfoot hill, at a depth of 670 ft. This property is owned by the Hoosier Mining Co., and is under lease to Marsh & Hodges. Samples taken across a width of 1½ ft. assay several ounces per ton. The lessees are also mining a low-grade orebody on the 400-ft. level, from which shipments are being made to the Wishbone cyanide mill.—— The Carey lease, on the Anchoria-Leland, situated on Gold hill, is making regular shipments of two to three cars per week. A vein of fair size is being mined west of the shaft on the 400-ft. level; it gives returns of $40 per ton.—— A small rich streak is being worked by lessees on the 700-ft. level of the Granite mine, east of the Gold Coin shaft. The lessees have recently made a shipment of 22 tons, which assayed 7 oz. per ton. The streak is oxidized.—— Ore is being shipped from the Fairview property, block 102 of the Stratton Estate, to the Golden Cycle mill at Colorado City. The first shipment ran $17 per ton, the ore being obtained from the 600-ft. level of the mine. Operations are being carried on through the Chicago & Cripple Creek adit, the workings being 2,000 ft. from the entrance. Raising is in progress on the vein, which averages 4 ft. wide, and better returns are expected from the next shipment.

Rich ore has recently been shipped from the Modoc mine, situated between the mill and Battle Mtn. A carload of screenings obtained from the 675-ft. level on company account ran around $150 per ton. Lessees are working the property from the surface to a depth of 500 ft., while below this company work is being carried on. ——It is stated that the Granite Gold Mining Co. intends to start the pumps at the Gold Coin shaft. The water is now within 33 ft. of the 9th level, and bailing will be commenced to uncover the big pump on the 1,000-ft. level. The unwatering of this shaft will help the draining of the Battle Mtn. properties.—— A circular letter has been issued to the stockholders of the Gold Dollar Consolidated Mining Co. giving an account of operations. The figures for April were not to hand, but for the three preceding months there were shipped 659 tons of ore, which netted to the company royalties amounting to $3,829. Ore has been opened up in four new places on the property by lessees. The first of these was made on the 6th level of the Mabel M., and has been developed for a little over 100 ft., and is from 4 to 16 ft. wide. Assays range from $20 to $60 per ton. The second strike was made in a raise from the 8th level on the east vein; it is about 2 ft. wide, and assays from $60 to $100. The two other strikes were made near the Union shaft and old Gold Dollar workings.

Wiring is in progress to connect the large motor situated at the portal of the deep drainage tunnel with the electric power at the El Paso mine. The recent bad weather has caused delay, but it is expected that the work will be completed within the next few days, so that the 12-drill compressor may be started to work as soon as the contract for driving the big bore has been let.—— The Union Leasing Co., operating the Proper claim of the Stratton Estate, on Gold hill, has found a promising vein 10 ft. north of the Proper shaft. The ore is 4 ft. wide, and was cut at a depth of 165 ft. Samples taken across this width run several hundred dollars per ton.—— Good ore has been found on the Mineral Rock claim, block 213 of the Stratton Estate, on Bull hill. Gus Johnson, who is working this ground under lease, struck the ore near the surface, and the vein as now exposed assays $100 across the entire width.

The cyanide mill of the Blue Flag Mining & Milling Co., on Bull hill, will commence operations during the next few days. Twenty-five tons of ore per day only will be treated at first until the plant is in full working order. The low-grade oxidized ores of the Blue Flag mine will be handled by the mill exclusively, there being several hundred tons already broken in the stopes.

Salt Lake, Utah.

More Copper at Bingham.—Last Chance Mill Started.—A Carpenters' Strike.—Shipments From Park City.

A shipment of 35 tons of copper ore from the New England Gold & Copper Co.'s mine at Bingham last week netted $40.33 per ton, the controls showing 8.1% copper, 0.32 oz. gold, 3 oz. silver, with an iron excess of 15%. This ore came from the Nast adit and was found in a hitherto unexplored portion of the property. It was also the first car of copper ore ever produced from the mine; the previous shipment being principally valuable for lead and silver. Henry M. Adkinson, the manager, is running the mill two shifts of 10 hours each and is making regular shipments of high-grade lead-silver ore. It is said there are four years' supply of mill-ore available without further development. The plant is treating about 60 tons daily.——The Last Chance mill of the Nevada Utah Mines & Smelters Corporation at Bingham is in operation again and is turning out about five tons of concentrate. The product contains about 10% lead and from 50 to 70 oz. silver. Superintendent Kirk makes the claim that a two years' supply of mill-ore has been developed in the mine.

A carpenters' strike at the new mill of the Boston Consolidated Mining Co., at Garfield, has had the effect of retarding the progress of construction work. The men wanted higher wages, but their demands were refused by the contractors. At the mine in Bingham, much activity is in evidence. Four steam-shovels are busily engaged in removing over-burden from the low-grade copper deposits, and a tramway is being built from the open-cut to the loading station, where the ore will be put on railroad cars for shipment to the Garfield mill. It will take 90 days to build the tramway.——The completion of the Markham Gulch mill in Bingham cañon is scheduled for about the 15th inst. While the plant is practically ready now, it will take two weeks more to finish the pipe-line through which it will be supplied with water. The mill is owned jointly by the Utah Apex and the Utah Development companies.

The ore shipments from Park City last week amounted to 2,457 tons, the contributing mines and respective amounts being: Daly-Judge, 925 tons; Silver King, 751; Daly-West, 601; Ontario, 180.——The development of the Ingot property in the Mercur district is now progressing steadily and with satisfactory results. The company has recently re-timbered and repaired the shaft. The plan to consolidate with some adjoining properties is still in abeyance.——The initial bars of bullion from the mill of the Jennie Gold Mining Co., at Gold Springs, Iron county, have been brought to Salt Lake, the lot weighing 14 lb., and being valued at about $1,500. The plant is handling about 40 tons of ore per day.——The Lower Mammoth Mining Co., operating in the Tintic mining district will soon declare its first dividend. Ore for shipment is being mined from the 1,700-ft. level.—— The grading of the new Eureka railroad has begun. This road will operate between the principal mines of the Tintic district and the smelter to be erected during the present year by the Tintic Smelting Company.

Toronto, Canada.

New Companies.—Larder Lake.—Shipments From Cobalt.—News of Developments.—Discoveries Near Sturgeon Falls.

Notwithstanding the depressed condition of the stock market, the formation of new companies shows no signs of falling off. Last week fifteen new mining companies, several of them being Larder Lake propositions, obtained provincial charters, the aggregate capitalization being $13,690,000. The conditions under which claims have been staked in the Larder Lake district are likely to result in endless confusion. Some 4,000 locations have been staked, not one of which has so far secured a patent, as this cannot be granted until the claims have been passed by the mining inspector and the required development work performed. A large proportion of them have been staked through deep snow and the stakes are likely to be swept away by spring freshets or otherwise removed. A large number of claims has been bought up by speculators and company promoters as the basis for concerns with big capitalizations, in which the public are now being asked to invest. Owing to the number of 'snowshoe' claims on the market, the prices at which they can be obtained are low, running from $40 to $100, which, under the circumstances, is probably more than some of them are worth.

Shipments of Cobalt ore for the week ending April 27 aggregated 93 tons from the following mines: Coniagas, 26 tons; Green-Meehan, 33; and O'Brien, 32 tons.—— Work on the big calcite vein on the Empress-Cobalt property, where a depth of 68 ft. has been reached, having been stopped by flooding from surface water, prospecting at the surface was begun last week and resulted in the discovery of a smaltite seam south of the main vein.——The Cobalt Lake Mining Co. has taken, from its No. 2 vein, 15 sacks of smaltite averaging 80% silver. Good samples have been secured from No. 5 vein at 46 ft. and small shipments will be made for testing purposes.——At the Trethewey, work has been begun on the new vein near the centre of the property and at some distance from the main workings. The two shafts will be connected when sufficient depth has been attained.—— The Progress Co., operating in the area south of the Temiskaming and Beaver mines, has sunk a shaft to a depth of 70 ft. and is commencing to drive at that level. ——The Duchess Mining Co., in the same neighborhood, is putting up camp buildings.

The Montreal Cobalt Co., which is sinking a shaft near Gillies station, has recovered the vein that was supposed to have pinched out.——D. M. Gilpin has returned from England where he was endeavoring to interest financiers in Cobalt properties. He is encouraged by the prospect, but reports that English investors want the endorsement of their brokers before buying. The firm of Gibbons & Co. has undertaken to send an expert to report on the Hazel Jule claim and incidentally on Cobalt conditions generally. Displays of Cobalt ore at the London immigration office are arousing some interest. John A. Church, mining engineer of New York, has gone to Larder Lake on an extended trip in the interests of New York capitalists, who intend spending a good deal of money in development work.

A few miles west of Sturgeon Falls, Ont., a vein of bluish quartz has been found 30 ft. wide, which has been traced over 80 acres. A shaft is being sunk and some samples showing pure gold have been obtained, and large pockets of copper pyrite have been cut. Farther to the west a large vein of bornite occurs, on which a shaft has been put down 20 ft. The ore is about 30% copper. A number of prospectors are looking for gold about 25 miles north of Sturgeon Falls. Some good finds are reported.

Denver, Colorado.

Mine Inspectors.—Contempt of Court.—Geological Work at Leadville.—The Next Senator.—Mining Opportunities.

T. J. Dalzell, Commissioner of Mines for Colorado, has announced the appointment of the Rev. J. R. Wood, P. T. Buckel, and N. J. McCarthy as mine inspectors.

The decision of the Supreme Court at Washington that there was no ground for appeal in the suits for contempt of court brought against T. M. Patterson will mark, it is to be hoped, the beginning of the end of this seemingly interminable litigation. It is refreshing to find that Senator Patterson has been defeated in every instance, and that the prostitution of the functions of the public press to serve as the means of forwarding partisan politics, and the gaining of unworthy ends, is not to be permitted. The abuse of the power of the press in this instance was particularly flagrant, for the attacks were chiefly launched at the Courts of the State, with the aim of undermining public confidence in them, and the arousing of public feeling against them. A newspaper that is a political asset deserves little respect; a newspaper that devotes its energies to undermining public institutions to gain private ends deserves to be suppressed. The next best thing is to fine the owner, and apparently that desirable result is about to be accomplished.

The preparation of the monograph upon the ore deposits of Leadville by the United States Geological Survey almost marked an epoch in the history of that institution. The keenness of observation and accuracy of inference in its preparation have been amply proved in the way in which the features uncovered by the later operations of mining have coincided with the predictions made in the monograph. So high is the regard in which this publication is held that if the miner discovers a lack of coincidence in some minor point, his first thought is that it is the fault of the rocks, rather than of the geologist. The report as a whole stands as one of the monuments of American geological research into economic problems. A short while ago, under the direction of the author of the original report, S. F. Emmons, a revision of it was made to incorporate such features as the greater exposures in the vastly increased workings had made more clear. One point not entirely cleared up at that time is the course of the Ball Mtn. fault through the region about South Evans gulch, and some companies have spent considerable sums in attempting to follow up ore-shoots that proved to be cut off. During the present summer J. D. Irving will make a careful examination of this area in order to map the fault accurately. No better example of the economic application of pure science could be desired. A brief period of study by a technical man with adequate training for the purpose will obviate the necessity for the expenditure of large sums of money, and equally valuable time.

Political rumors as to the probable successor of Senator Teller are already beginning to circulate. It is said that the party leaders in Denver are in favor of F. E. Brooks, while the Howbert wing of the party supports C. C. Hamlin. In either case Colorado Springs seems to be slated to furnish the next United States Senator for Colorado. Jesse F. McDonald, of Leadville, and A. E. Bent, the present State treasurer, are the candidates mentioned for the governorship.

Colorado can scarcely regard the present boom in Nevada with simple sisterly pride and affection. Many mine owners who have profited from investments in Colorado properties are now investing their surplus in Nevada. "The distant hills," they say, "are always green," and there seems to be an allurement which dis-

tance casts about a mining district that makes it seem more attractive than one nearer home. It is not to be forgotten that though the chances for gain in the sudden development of new districts are greater, the chances for loss are correspondingly increased. The most substantial fortunes have been taken out of mining camps after their booms have long subsided. On the man who puts his money into a boom camp, just as he might perhaps lay it on the turn of the roulette wheel, for the fun of the thing, and not caring much whether he may win or lose, there can be no comment other than that it is his privilege. But the Colorado man looking for substantial mining investments can find enough of them at home.

Pioche, Nevada.

A Lively Camp.—Building of the Railroad.—Lack of Lumber.—Lawson and His Antics.

Pioche is beginning to feel the vivifying influence of the incoming railroad. The usual advance guard that precedes a boom is here and the numbers are increasing daily. Every available bed in the town is occupied each night, and one or two new tents go up daily.

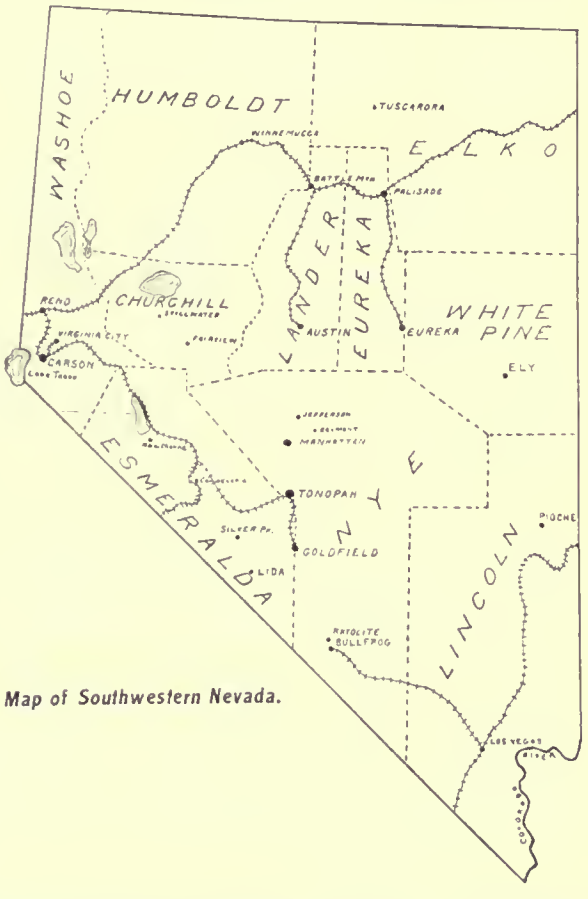
Mendenhall & Deal, the contractors for the new line, are crowding the work just as fast as they can with the force obtainable. Report comes in that men are shipped to Caliente by every train, but that many who have had their fare paid on the railroad, desert, either without reporting at all at the grading camp, or quit after doing a day or two of work. In spite of such annoyances, which are not without precedent in these days of prosperity, the grade is already finished three miles this side of Caliente, ties have been distributed for some distance and laying of steel is to begin at once. Unless some unforeseen hindrance occurs, the cars may be expected here some time in July. Word comes from Caliente that the material for the new Pioche depot has begun to arrive, and that it is the purpose of the company to erect an imposing structure here. Perhaps the most important railroad news is an item from Los Angeles, given me last evening by a man in a position to get inside information. He tells me that the line is to be extended without any stop whatever to a distance of 46 miles from Caliente. As the Ida May property, which has recently been secured by W. A. Clark, Jr., is just 46 miles from Caliente it seems reasonable to suppose that the railroad will go without delay to that property.

The Bristol, just across the hill from the Ida May, has already begun shipping by wagon to Caliente, whence the ore goes by railroad to Salt Lake. This seems to confirm a persistent rumor of a strike of high-grade copper ore recently made in that old property. It seems rather extravagant to pay $14 per ton for wagon freight on ore that in a few weeks could be put onto the cars for not to exceed three dollars, but probably the management feel that they have a reason which justifies their action.

The crying need of Pioche is lumber, of which not a foot is for sale in the town. No one had the nerve to put in a stock last year when a contract could have been made to freight it in from the railroad at $8 per thousand. Now the price is $15 and teams can only be had to bring in a few hundred feet occasionally. The amount of freight of all kinds awaiting transportation from the railroad exceeds the capacity of the wagon outfits on the road. Last week I had to pay $20 per ton to get freight in from Caliente as against $8, the prevailing rate a year ago.

A great deal of prospecting is being done in the hills in every direction and new strikes are daily reported. A number of the old properties have a tonnage already in sight running up into the hundreds of thousands of tons in the aggregate, which will be waiting for the cars when they arrive. Of this I hope to speak more in detail in subsequent letters.

Two months ago today the papers of the East were ablaze with announcements headed 'Coppers, Nevada-Utah' and signed by Thomas W. Lawson. For weeks the resources of the 'lambs' waxed and waned and a large portion of that susceptible community lost much sleep listening for "the reports of my experts," who were represented as being diligently engaged in examining the Bingham and Pioche properties of the Nevada-Utah. Each day they were fed some new variety of pabulum, but the dish was always labeled 'Coppers, Nevada-Utah.'



Map of Southwestern Nevada.

The announcement of March 5 stated "I now have the reports" and gave the assurance that the following day the announcement would contain his "conclusion." The following day an expectant public was told that "after going over the experts' reports of the different Nevada-Utah properties I must postpone my decision, etc." March 8 the announcement said "This space is reserved for the report of the mining experts engaged by me to examine the different properties owned by the Nevada-Utah Company." Whether he is still announcing and the hearts of the lambs still palpitating I do not know. In view of all this frenzied finance, it is interesting to know that at neither Bingham, Pioche, nor Jack Rabbit does the Nevada-Utah possess a single copper mine, although it does possess at each place some exceedingly valuable silver-lead properties. Also in this connection I may quote a statement made to me a day or two ago by Mr. Latfan, general manager of the Pioche and Jack Rabbit properties: "No person on behalf of Mr. Lawson has ever visited the property of this company under my charge to make an examination, or for any other purpose whatsoever." Mr. Freundenthal, who for two years prior to April was superintendent of the property, emphatically confirmed Mr. Latfan's statement.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A CAM SHAFT is generally long enough for two batteries with the overhang for one pulley. Driving single batteries materially increases the expense of belts and pulleys.

FIFTY YEARS AGO the copper-blast furnace consisted of a small shaft, lined with firebrick or stone, and having at its lower extremity a crucible for the collection and separation of matte and slag.

ROASTING REACTIONS are confined mainly to the surface of the layer of pulverized ore which lies upon the hearth, and the deeper sulphide particles experience but little oxidation as long as they are buried, unless left for a long time.

IN the average mill the question of slime treatment generally offers room for improvement. In considering the question there are two general ideas to be considered —the prevention of slime as far as possible and the treatment of such as are unavoidably made.

THE dynamite which has been under water at the bottom of the 700-ft. well, should not explode on being exposed to the air. In fact, it will probably be found difficult to explode it, even with a strong cap, and if it can be exploded at all, its force will be found greatly diminished.

BY PYRITE SMELTING is meant the smelting of a pyritous ore mainly by the heat arising from the combustion of its own constituents. Complete pyrite smelting has not yet become continuously feasible in practice, and in all pyrite furnaces a small amount of carbonaceous fuel is added to the charge.

THE difference in the explosion of compounds and powder, is that in the former the whole charge explodes simultaneously by concussion, while with powder the fuse sets fire to and explodes the grains nearest it, these communicate the fire to those touching them, and so on, until the whole charge is fired.

THERMOCHEMISTRY is that branch of chemistry which deals with the amounts of heat evolved or involved in chemical reactions. It is the most important side of chemical science for the metallurgist, because it concerns the whole subject of the utilization of fuel, and the reduction of metals from combination.

STATISTICS indicate a big increase in the consumption of sheet mica during the past year, in the United States. The imported mica comes from Canada and India, this country taking about one-half of the output of the Canadian mines. Ground mica, of Canadian origin, is not imported on account of the tariff.

IN the production of steel, varying proportions of ferromanganese or spiegeleisen are used, depending on the character of the product desired and the process used, and to supply this need the bulk of the manganese ore imported as well as the domestic ores are smelted to produce 'ferro' or 'spiegel,' and liberal quantities of these metals are also imported.

IN milling concentrating ore, the cleaner the concentrate, the greater is the loss in the tailing, and consequently the less is the saving. The question is, whether the value of the high-grade concentrate more than offsets the increased loss in the tailing. Local conditions, such as freight rates, smelting charges, and quality of the ore, generally decide this point.

DOUBLE DISCHARGE MORTARS have been found unsatisfactory in many stamp-mills, because a mortar of this kind requires more water per ton of ore stamped; it gives less time for battery-amalgamation; the splash acts less violently upon the screens, which are more likely to clog; and the back screen is generally awkwardly situated for changing or inspection, and is often neglected.

THE production of manganese ores in the United States is not important in either quantity or value, for most of the manganese ores used here have been imported from foreign countries. The quantity of manganiferous ores produced, however, is much in excess of that of manganese ores, the distinction between the two being practically based upon the manganese ores yielding 40% or more of metallic manganese.

IN reply to the question sent us from Columbia, Cal., it is difficult to advise about breaking ground with the meagre details given. If the rock is a hard limestone, we would suggest using quicker powder—certainly not slower—and a wide centre cut angle, and then long back and breast holes, and lifters. We should consider black powder as entirely unsuited to the work. Try deeper holes, faster powder, and heavier loads.

THE electric motor adapts itself to various conditions, and frequently is used to supply the motive power to a device which competes directly with a similar electrical device. For example, the chief competitor of the compressed-air rock-drill is the electric drill, and one of the later and interesting developments of compressed-air drills has been the addition of a small electric motor driving a little local compressor for supplying the operating power to the drill.

THE source of commercial muscovite is generally pegmatite dikes. These are vein-like masses largely composed of the granitic minerals, quartz, feldspar, and mica, and are common in most areas of crystalline rocks, whether granites, gneisses, or metamorphosed sedimentary formations. The dikes intrude the country rock, following whatever planes of foliation may be present, or cutting across these and often passing into irregular bodies of considerable size.

THE asphaltenes are probably unsaturated hydrocarbons, or derivatives of them, in highly condensed form, possessing a high molecular weight, but concerning their structure, comparatively nothing is known. They contain the major part of the sulphur extant in asphalt, and are characterized usually by the presence of remarkable quantities of it. The higher the sulphur-content the harder the asphalt. Normal asphalts leave, after heating, about 15% coke residue, a fact which enables us to distinguish them by this characteristic alone, from other solid bitumens.

THE demand for the mineral monazite, which contains the oxides used in the manufacture of mantles for the Welsbach and other incandescent gaslights, is constantly increasing, and many inquiries are made regarding the source of supply of this mineral, not only for domestic but also for foreign consumption. Although monazite has been found sparingly at many localities throughout the United States, the Carolinas are still the only States that are producing this mineral commercially. The results of the investigation of the Geological Survey, at Portland, have shown the presence of some monazite and more zircon in many of the sands of the Pacific slope, especially in those from Oregon and Idaho.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanide Practice at the Waihi.

The Editor:

Sir—In your issue of December 15, 1906, under the heading 'Progress in Cyanidation,' the statement is made that "at the Waihi, treating 25,000 tons per month, it requires seven men continuously to clean the boxes, using zinc shaving."

This statement is apt to convey a wrong impression, the position being that these men not only clean the boxes weekly at three separate plants cyaniding a total of 27,000 tons per month, but also do all work connected with the acid treatment and smelting (weekly) of the zinc-gold slime, amounting to about five tons dry weight per month, and producing over 100,000 ounces of bullion.

E. G. BANKS.

Waihi, New Zealand, March 15.

Ore Deposition.

The Editor:

Sir—The metals gold, silver, copper, platinum, and more rarely iron, are found in a metallic state in nature and are commonly called 'native.' The word 'native' as applied to these metals carries with it the implication that they are original depositions.

The usual explanation of their being in a metallic condition, is that they have been derived from the baser ores by action of surface waters. All surface waters carry air, carbonic acid, and salt in solution; and through the oxidizing action of the dissolved air, the sulphide ores are changed to sulphates, oxides, and chlorides. The soluble salts being carried down along the veins encounter unaltered sulphides and the reducing action of the sulphides on the sulphates results in depositing the metals in forms intermediate between the two.

This seems to be a satisfactory explanation as applied to sulphide ores of copper, such as occur in Montana and Arizona. The zone of secondary enrichment is usually present at from 300 to 800 ft. in depth, and within this zone the mines are in bonanza, while below that zone usually they get into poor ore. The upper portions of the Butte veins were free of copper and were milled for gold and silver. The Anaconda company started to build an amalgamating plant before they discovered that they had a copper mine.

There is usually enough salt in the surface water to precipitate the silver as chloride; and in this form it is found occasionally in large amounts as horn silver, some of the mines of Leadville, Aspen, and Tombstone being noted for such deposits. In desert regions, almost without exception, that silver occurs in the oxidized portion of the veins as chloride. So much is this the case that it gave rise to the term 'chloriding,' as meaning prospecting for chloride ores of silver.

Native silver is sometimes found in the zone of secondary enrichment, but that is rather unusual; and its presence in large quantity suggests another cause of deposition. Where the climatic conditions are favorable to the growth of a large amount of vegetation on the outcrop of the vein or in the drainage passing over the outcrop, then by the decay of such vegetation, organic matter will be added to surface waters. This organic matter will act as a reducing agent and precipitate silver and copper from their sulphate solutions. The growth of vegetation requires rainfall and is in direct proportion to it. The increase of rainfall would dilute the surface waters and decrease the percentage of salt derived from the decomposition of the rocks. Therefore, the silver should occur as chloride in the oxidized ore of veins in desert countries and as metallic silver in countries where rainfall and vegetation are abundant. This, I believe, is the case; at least, chloride ores predominate in desert countries. When the ores contain arsenic the silver frequently occurs as ruby silver as a result of secondary enrichment and it should be in that condition at Cobalt if due to secondary enrichment.

The ores of Cobalt, in Ontario, have been the subject of much investigation and speculation as regards their genesis and I have proposed a theory to account for the presence of the metallic silver below the zone of secondary enrichment. Glaciation of the surface has gone to such great depth and has been so recent that there is no zone of secondary enrichment of any consequence.

Throughout these northern regions unaltered sulphides occur at, or near, the surface, and any explanation of the occurrence of native silver should not pre-suppose a zone of secondary enrichment.

At the Toronto meeting of the Canadian Mining Institute, Prof. Van Hise read a paper on the geology of the Cobalt district. In the discussion of his paper, I offered the suggestion that the metallic silver was deposited contemporaneously with the other minerals by the action of hydrocarbon gases asssociated with the ascending hot solutions. Prof. Van Hise and others took the ground that the metallic silver came from above and was due to secondary enrichment. I suggested that the presence of graphitic stains on the walls of the veins, on slickenside surfaces, as well as the graphite associated with the ore, indicated that hydrocarbons had been present during deposition. If present, they would act as powerful reducing agents and precipitate metallic silver. This method of deposition would avoid the necessity for pre-supposing a zone of secondary enrichment, which may have existed, but has since been eroded. The suggestion was not received with thunderous applause, but it brought out the fact that graphitic stains and carbonaceous material do occur with the ore. It was further stated that in the Silver Islet mine, near Port Arthur, the same deposits of graphite occur associated with metallic silver, and that hydro-carbon gases were encountered in the mine workings in sufficient quantity to burn under rock pressure and to cause trouble with the ventilation. The Silver Islet mine is directly north of the copper mines of Michigan and no great distance from them.

The presence of hydro-carbon gases in mineral veins is therefore established, and the record of their having been associated with the mineralizing solutions is attested by the graphitic deposits referred to. However, I had the honor of being a minority of one in connection with this suggestion, and since that time I have been looking for corroborative evidence. In a communication published in *The Engineering & Mining Journal* of March 30, I set forth the effect that such reduction during deposition would have, and suggested that the same principle might account for the deposition of the metallic copper in the Lake Superior region. Since that time I have read in 'The Geology of South Africa,' by Hatch and Corstorphine, that "In some rich conglomerate reefs, carbonaceous matter is plentifully present; possibly this substance may have played a part in the precipitation of the gold."

It seems more probable that the carbonaceous matter is the result of deposition from hydrocarbon gases, and that the gold was also precipitated by the gases associated with the solutions. With a precipitating agent associated with ascending hot solutions, deposition would

take place in proportion to the relief of pressure and reduction of temperature, and this would be greater near the surface. It is the sad experience of miners that ores do not get richer with depth. Secondary enrichment may make it appear that they do so for a short distance, but below the zone of secondary enrichment the decline is persistent in both size and grade. Who has not listened to the optimistic prospector telling how his vein is like a wedge with the big end down? And who has not had the sad experience of parting with his money, because the prospector did not know and could not understand (even as you and I)?

The advocates of the different theories of ore deposition seem to be divided into classes, which, for brevity, may be called magmatic segregationists, lateral secretionists, and hot-water men. The third group is divided into two groups, one of which believes that the water derives its heat and minerals from intrusive masses near the surface, the water being of surface origin. The second group, of which I count myself a member, contend that the water is of magmatic origin and is an addition to surface waters. These waters, in addition to the dissolved minerals, contain various gases in the same manner as the emanations from volcanic vents.

It is a well established fact that various hydrocarbons are discharged from volcanic vents, and Mr. Eugene Coste has written a most excellent paper on the volcanic origin of petroleum and natural gases. On this hypothesis it is conceivable that mineralizing solutions could contain them, and their actions on solutions containing gold, silver, and copper would result in precipitating the metals in a metallic state. The presence of hydrocarbons would be necessary for the precipitation of native metals below the zone of secondary enrichment, and in cases where these native metals do not occur, it would appear that hydrocarbons were absent during deposition.

In the case of Lake Superior copper ores, as all the copper is present in the form of metallic copper, this fact precludes the possibility of its being derived from pre-existing sulphides. As it is in many cases associated with conglomerate beds of sedimentary origin, it plainly was not deposited by magmatic segregation. If the graphitic material associated with vein-matter were the precipitating agent, then the greatest amount of metal should be in direct contact with it. This is not the case, and it therefore appears that the graphitic material is merely incidental to the presence of the hydrocarbons.

Instances have been known and recorded where lavas have yielded hydrocarbons from amygdules, and the flowing asphaltum spring of Trinidad is hot. Under such conditions it seems reasonable to suppose that iron might be reduced to the metallic state and remain as grains in suspension in the viscous mass. This would explain such occurrences as are known in Greenland and also the ferro-nickel beach sands of Martinique.

In 'The Geology of South Africa,' above quoted, the authors, referring to the origin of diamonds, say: "From the state of strain in which the diamonds are sometimes found—a condition which occasionally results in their destruction—and from the presence of cavities containing gas under enormous pressure, it is certain that they were formed at great depth." Here we have again evidence of the presence of hydrocarbons in the diamonds themselves, pointing to their being crystals of pure carbon derived from hydrocarbon gases under enormous pressure and temperature dissolved in the magma of 'blue ground.'

The different volcanic necks that contain the diamonds yield varying amounts per load, and some necks, which have all the characteristic appearance of productive mines, are barren of diamonds. This seems to me to indicate that the hydrocarbon gases necessary to diamond formation were absent in some cases.

If the magmatic waters contain hydrocarbons and cause the deposition of native metals in veins and diamonds under other conditions, is it not possible that both gold and diamonds might be deposited in the same vein?

In this connection I wish to refer to the reported occurrence of placer gold and diamonds in the same gravel beds at various points, especially in Brazil.

I think this question of reduction during deposition is deserving of more than passing attention on the part of men interested in ore deposition.

HIRAM HIXON.

Victoria Mines, Ontario, April 11.

Undesirable Citizens.

The Editor:

Sir—The letter of the President, and your comment thereon, in your issue of April 27, indicate that you possess some knowledge of the acts and utterances of Moyer and Haywood not known to the general public, and that you are either ignorant of, or ignore, facts that are generally known to others. If such is the case it seems but right that the public should have the benefit of what you know, and I shall mention some of the things that the President and yourself don't seem to know. Both of you intimate that these men are guilty of other crimes besides that for which they are now held; but if so, why have they never even been tried for them? Their bitterest enemies have for years had complete control of the States of Colorado and Idaho, and the backing of the National administration; and have made use of the governors, legislatures, and courts, and of the soldiers, sheriffs, and Pinkertons without daring to even put them on trial.

They abused them, beat them, threw them into jail, and tried to frighten them out of the country, and failing to do that, had the soldiers take them out; their whole treatment being a fine example of the "square deal" for which the President calls for so vociferously. Utterly baffled in all their attempts to drive these men out of Colorado, or to hold them in prison there, their enemies next made use of the Steunenberg murder as a pretext for kidnapping them, carrying them to Idaho and imprisoning them; the whole proceeding being a most shameless travesty of law and justice.

Their treatment in Idaho would have been a disgrace to Russia, until their comrades took up the matter and the force of public opinion made it more decent, but it brought no word of disapproval from the apostle of the "square deal," though he went out of his way in his 'muck rake' speech, to refer to them as labor leaders "implicated in murder." It was not until these men had been months in jail and had tried in vain to get from the courts the justice they were entitled to, that their comrades asked the President to help them get it, and surely they are not to blame for hoping that the Strenuous One who was willing to use the whole military force of the nation to put a few Japs into the white schools of San Francisco, would at least notice their petition. These men have been kept in jail 14 months without trial; the Governor of Idaho says, "they are guilty and will never leave the State alive"; the judges and other State officials are their avowed enemies; the United States judges wrap themselves in their robes and disclaim jurisdiction, and the President again gratuitously refers to them as undesirable citizens; yet he is shocked at the moral obliquity of their comrades in demanding an explanation and a fair trial, and tries to turn public sentiment against the unions, by representing them as defenders of criminals.

who are entitled to no consideration whatever even if not convicted of the murder of Steunenberg. Let me add that I am not a member of the W. F. L. or any other organization or union, and that my only motive in writing this is love for a "square deal" that is "square."

J. A. LA GRAVE.

Greenwood, Cal., May 1, 1907.

[We are not possessed of any exclusive information on the subject mentioned, nor apparently is our correspondent, although he makes a number of assertions that are without basis of fact.

If the legal advisors of the men mentioned had been willing to bring them to trial, the case would have been settled long ago in the ordinary course of events. The removal of Moyer and Haywood from Colorado to Idaho has been passed upon by the Supreme Court of the United States and we happen to be among those who accept its decisions as authoritative and just—within the limits of human judgment. If the method of arrest was unusual, so also were the circumstances, as is well known to the mining communities of the West. It is a mistake to refer to Russia; in that country the methods of industrial and political agitation adopted by the Western Federation of Miners would have been abruptly terminated long ago. Fortunately their leaders are in the United States and they will receive fair trial. The majority of thoughtful people deplore the vendetta that disgraced Colorado a few years ago and only ask that all law-breakers shall be punished. At that time we ventured to condemn the mine operators for their high-handed acts, and for taking steps that tended toward the break-down of popular government in Colorado.

The law is greater than either the mine workers or the mine operators, and the support of it is essential to what is termed civilization. We approved the letter of the President and we admired the manliness of his utterance because he said what most men are afraid to say, namely, that Harriman and Haywood are alike 'undesirable citizens.' For ourselves we feel that most of our readers are fairly well aware of the labor unrest—if not worse—that we owe to Moyer, Haywood, and Debs, while the mining community as a whole does not realize sufficiently that Harriman is equally as undesirable and as much more to blame as his association with educated and thoughtful men has given him standards of morality that he has flouted. The fact that he has millions makes his wrongdoing the bigger and his responsibility the greater. This would be more fully recognized if all of us were not a bit obsessed by the vision of stupendous wealth; a man steals ten dollars and he is called a thief; another transfers a million to his pocket and he is a financier; a third juggles with the stock of a big railroad and enriches himself by ten or twenty millions, and he is labeled a great man. Nevertheless, each act is dominated by the same motive and the larger scale of the performance ought to make it so much more damnable, in that it affects the interests of an increasing number of people and is performed by men of greater intelligence. It is well to ventilate these matters and that is why we publish our correspondent's letter, giving him a square deal to the extent of telling him that we disagree wholly with his perverted sentiment.

Obviously the arrogant labor leaders are astounded at the President's daring; they never expected so clever a politician to speak so frankly. They have been holding mass meetings and trying to influence public sentiment in advance of the trial, attempting, in fact, to make a fair trial impossible—the very thing charged to the President.

They are enraged because their tyranny over the laboring men in the West is challenged. They have thriven on the weakness of corrupt politicians and they are startled by the retort of a fearless statesman; he called their bluff. And if further evidence is needed of the sort of thing that Moyer, Haywood, and Debs stand for, it can be found in the *Appeal to Reason*, a wretched sheet which, like Hearst's newspapers and a good many others, disgraces journalism and exhibits the vulgar license to which the liberty of the press has descended. In the issue of April 20 we find a long article by Debs vilifying the President, a mere rigmarole of perfervid rot, illustrated by disgusting caricatures and topped with the call 'Down With the Despot!' This won't do in America, and the sooner organized labor separates itself from such advocates, the better for it. The public is getting weary of the preaching of violence and the incitement to disorder by those who speak for the labor unions, just as it is impatient over the corrupting tyranny of predatory financiers and the cheeky effrontery of men who, while trustees for investors, play the market like common gamblers.

The President spoke the truth in a fearless way, and we honor him for it.—Editor.]

Slime-Filtering.

The Editor:

Sir — Seeing the necessity for a continuous filter in connection with the slime treatment of silver ores, and not finding any reference in your valuable journal, I wish to call your attention, and that of some inventor, with means to perfect the idea, to the filtering by centrifugal force, as in the sugar mills, with the difference of raising and discharging the cake over the rim by fixed scrapers, the cake to fall into a second centrifugal machine below the first, where it is washed and filtered with weak solution to be finally discharged with water.

Although convinced that the ever alert inventor has this idea near practical perfection, it would be perhaps a benefit to the mining industry to have it worked out without patent, and for this reason my insinuation in case nobody should have taken one on this method.

Please use this to the best of your judgment without any name.

OLD SUBSCRIBER.

Mazatlan, Mexico, April 12.

Salton Sea.

The Editor:

Sir—I notice in a recent issue that one of your correspondents ridicules the idea that the filling of the Salton Sink has influenced the climate of Nevada, and goes to considerable trouble to show that the evaporation from such a small body of water would not produce much rainfall. All of this is perfectly obvious. A glance at any map will show the relative sizes of the Salton Sink and of the desert. Modern investigation of rainfall has shown that rain is produced by areas of high barometer followed by areas of low barometer and that these conditions chase each other across the continent along certain paths. I think that with our present limited knowledge of the subject it would be impossible to say just what influence the Salton Sink may have on the meteorological conditions and hence on the rainfall. It does not, however, seem altogether improbable that the slight change in temperature and humidity on the *east side* of the Sierras brought about by Salton Sea may have materially altered the path of the rain-storms. It takes less force to alter the path of a current than it does to start or stop one.

GEO. J. BANCROFT.

Denver, April 18.

Mining at Bingham, Utah.

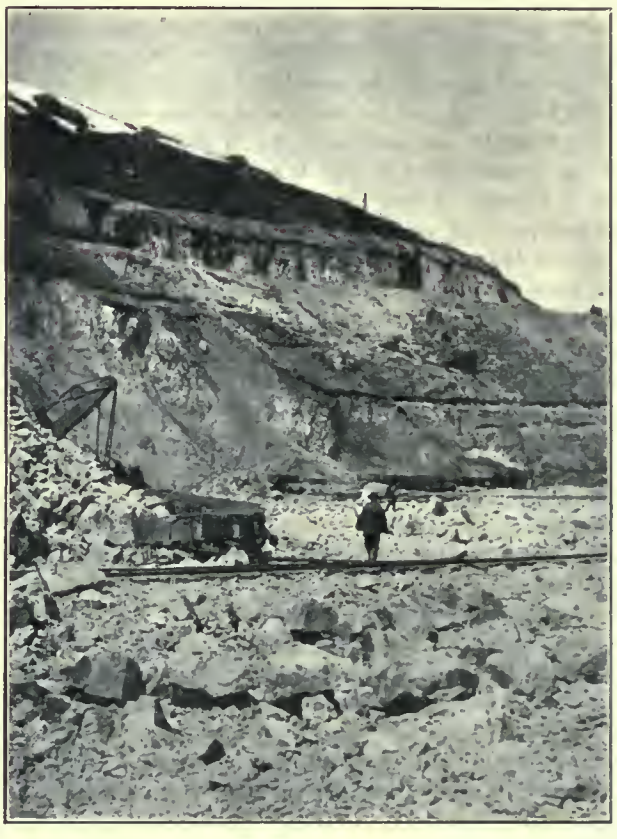
Written for the MINING AND SCIENTIFIC PRESS
By JAMES W. ABBOTT.

The stranger visiting this camp for the first time is, I think, impressed especially by the enormous areas of mineralized ground, mostly of low tenor, and the ingenuity of man in elaborating methods for realizing profit therefrom. Until quite recently the greater part of the material now designated as ore was worthless country rock, or sulphide mineral too lean to be utilized.

Bingham is one of the oldest mining camps in Utah, but in the earlier days its products were practically limited to gold, silver, and lead.

In all the history of mining, an industry ever fascinating perhaps for its surprises, no more astounding romance can be found than the transformation of the Highland Boy in Bingham cañon. Regarded and equipped as a gold producer, and fairly profitable for a time as such, after awhile the returns dwindled, then profits ceased, and the surplus capital evaporated until utter failure threatened its promotor, Samuel Newhouse, then on the threshold of his mining career. But just when the crisis was imminent, material that had been going over the dump as waste, was discovered to contain an unsuspected mineral, and Mr. Newhouse found himself at the head of one of the great copper enterprises of the day.

Looking Up Bingham Canyon. Highland Boy Buildings in View.



Deep Cut Into Overburden. Keystone Driller Sinking, Steam-Shovel Loading, and Train Removing the Waste.

Fortune, which has been so conspicuous in its attentions to Mr. Newhouse, had other equally startling surprises in reserve for him, in the very field of his original great success. On the opposite side of Bingham cañon he gradually acquired control of large holdings not included in the Highland Boy combination. In these claims diligent prospecting at length disclosed enormous lenses of copper-bearing sulphides, formed by replacement in limestone. And even this was by no means the limit. Further investigation revealed the fact that hundreds of acres of the old igneous intrusive monzonite porphyry, through the agency of a later eruptive, perhaps the same one that caused the replacement in the limestone, had been impregnated with copper-bearing solutions, which left in it a sufficient amount of this mineral in such condition and distributed with such astounding uniformity that the whole mass to great depths was turned into ore.

It is interesting to compare the large orebodies of Bingham and Ely, each of which is to be numbered among the world's greatest copper districts. At Bingham, as far as disclosed, it appears to be monzonite that has become ore through the influence of a later eruptive, while at Ely the great deposits in the Ruth and Copper Flat mines have been found to be later eruptives mineralized as the result of processes in which monzonite played an important part. By this statement I do not mean that anyone has suggested that the monzonite at Bingham has derived its copper principally from the late eruptives, or that the converse holds at Ely. In the complicated processes acting through many geologic periods each of those igneous rocks has played its part. Now it appears that at Bingham nature has prepared the monzonite for man's profitable use, while at Ely it chose the rhyolite for that beneficent function. The student of economic geology will hope that as development proceeds in each camp some new facts will be disclosed calculated to aid us in learning the complicated scheme of ore genesis from the first appearance in geologic time of any valuable element to its final concentration for man's use.

To reach Bingham one goes on the main line of the Denver & Rio Grande railroad, 11 miles east to Bingham Junction, then southwest, on a branch 14 miles, making 25 miles in all; the time consumed each way is one hour and ten minutes, with double daily train service. About five miles below Bingham is the junction of this branch with the new double-track line to Garfield, where the American Smelting & Refining Co. has already in operation a smelter of 2,000 tons daily capacity; the Utah Copper Co. (known as the Guggenheim property), is

about completing a concentrator to reduce (in the ratio of 20 to 1), over 4,000 tons daily of the Bingham monzonite ore, and where within six months the Boston Consolidated (known as the Newhouse property), expects to put into commission its concentrator of about the same capacity for a kindred purpose. It is a suggestive fact that neither of the three corporations just mentioned seems to feel half the concern about its own stupendous problems that it does about the ability of the double-track standard-gauge steam railroad, 21 miles long, to handle, as its exclusive traffic, the tonnage that Bingham will send to Garfield.

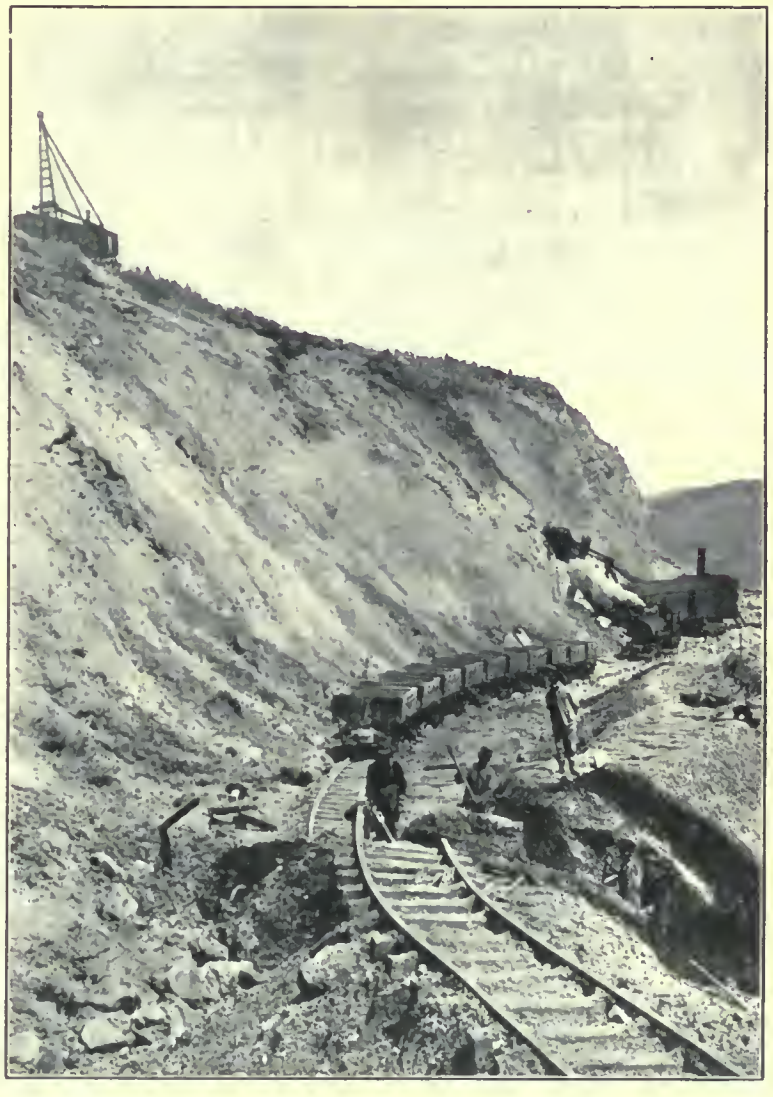
Two miles below Bingham, on the branch line, is the smelter of the Yampa Consolidated, which has been running successfully for a number of years. Half-way from this smelter to Bingham is a concentrator where the Utah Copper Co., treating 1,000 tons per diem of the monzonite ore, has demonstrated to its own satisfaction that it can produce copper therefrom at a cost of 10 cents per pound. I am advised by a conservative mining engineer, in a position to know the facts, that the Utah Copper has opened up within its ground 36,000,000 tons of this ore of an average tenor better than two per cent.

Arrived at the Bingham station the stranger finds about him a scene of impressive mining activity. Continuing up Bingham cañon, through which the railroad has come on a steep grade, runs the wagon-road to the offices of the Boston Consolidated and Utah Consolidated (the Highland Boy), each about two miles from the depot, while to the left is another branch of the cañon leading to Upper Bingham. The grade of the road up the cañon is very steep, seldom easing up to less than 12%, and reaching 30%, in places. The little opening occupied by the depot, and a few business houses, soon narrows to a width just sufficient for a narrow road, above which the houses stand on shelves dug into the hillside. On both sides the hill rises rapidly, the slope in places reaching 40%. Running all over the hillsides, to a height of 2,000 ft. or more above the town, may be seen the Copper Belt railroad, a standard-gauge feeder of the Denver & Rio Grande. Connecting with it is the narrow-gauge line of the Boston Consolidated, with its nine dinky engines frisking about like a lot of wild colts. In every direction, from adits, shaft-houses, and head-frames to smelters, concentrators, and railroad-bins are seen wire-tramways, with buckets that seem to flit about like a flock of birds. No wonder Salt Lake City feels jubilant with golden streams flowing into it from mints like Bingham, Tintic, Park City, and Ely.

Besides the Boston Consolidated, Utah Copper, Utah Consolidated, there are now operating at Bingham the Ohio Copper Co. (a Heinze property), Utah Apex, United States (property of the United States Smelting R. & M. Co.), Bingham Mary (a Bamberger property), Phœnix, Bingham Consolidated & Bingham, and the New Haven Copper & Gold Mining Company.

From its sulphide property the Boston Consolidated is sending daily to Garfield 750 tons of ore, which is loaded from bins at the mouth of the lower adit into cars for the smelter. From this deposit, which averages better than 3%, and is in places over 100 ft. wide, stoping is being carried on at three levels, the ore being dropped to the first, and there trammed out to the bins. On the same level as the bins are the sawmill and the lumber-yard. The cars that come for ore bring up the supplies and lumber, and the only hoist that will be required on the property for a number of years is a small one used to handle lumber and supplies from this yard to the upper levels.

About a hundred feet above the upper levels, upon a large yard built of waste from the overburden, are the engine-house, car and machine-shops of the dinky railroad. While the great concentrator is being made ready, this railroad is removing the overburden from the monzonite ore. Four 5-yard bucket steam-shovels are used, after Keystone drillers have determined the depth of the overburden, at points carefully located on the ground and on the map. This overburden, principally quartzite, is shaken up with giant, loaded by the steam-shovels onto the cars, and hauled away by the dinkies. The sulphide ore pays the bills.



Preparing to Lower the Track 10 Ft. and to Advance the Steam-Shovel.

The ore is to be quarried in steps, the tenor checked by drill-holes, and account kept on the whole proposition in the manager's office. The price of copper will determine the ultimate horizon at which the steam-shovels will stop digging.

A visit to Bingham might prove a beneficial experience to some people I know, who insist that making cotton cloth and raising potatoes lie within the domain of legitimate business, but that all mining is a lottery.

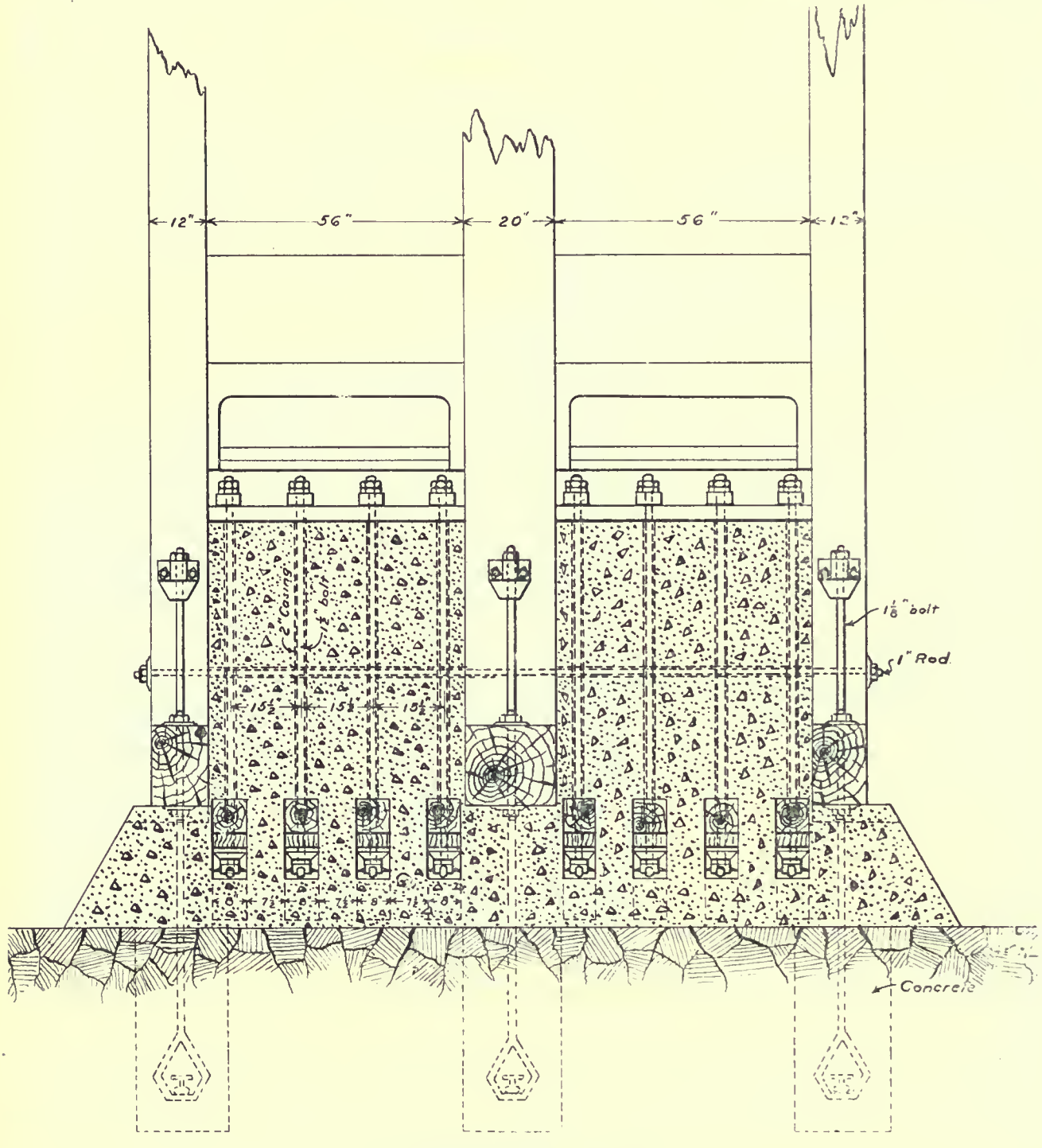
Battery Foundations of the Kuk-San-Dong Mill, Korea.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES D. KAEDING.

In the spring of 1905 this company, the Oriental Consolidated Mining Co. of Korea, began the erection of a 20-stamp addition to the 20-stamp mill at Kuk-San-Dong camp, installing concrete mortar piers and battery foundations. These were of a somewhat unusual type, owing to the local conditions, the most important of which is the distance from a base of supplies and a large foundry.

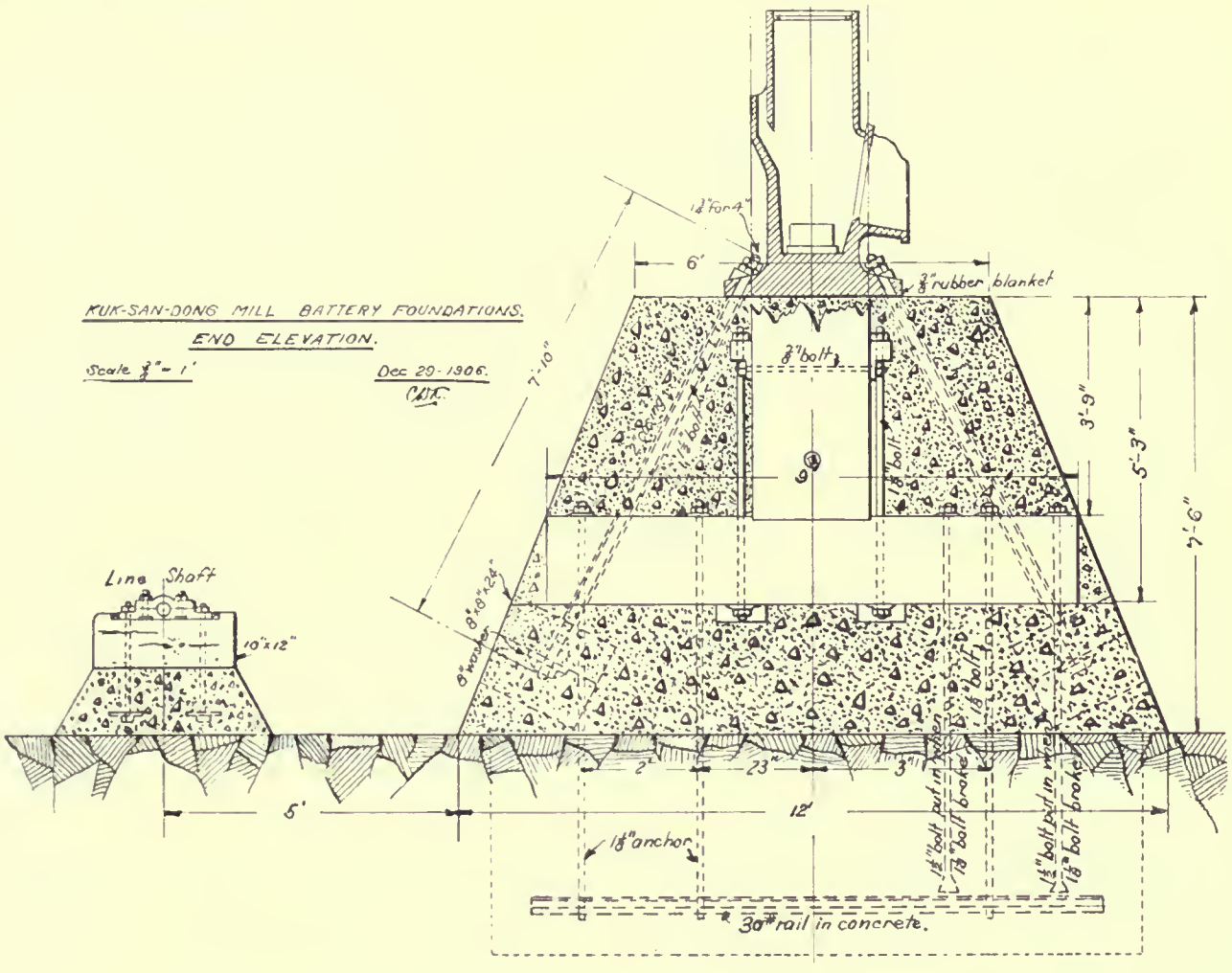
The machinery had been ordered by cable to be a duplicate of the twenty stamps in operation, and to have heavy mortars for concrete piers. The mortars supplied, pattern No. 48, Union Iron Works, of San Francisco, were designed for vertical anchor bolts 1¾ in. diam., the base being 36 in. wide by 56 in. long, and the weight, with liners, about 7,300 lb. The mortar was to rest on a ¼-in. rubber blanket placed directly on the concrete pier, and the anchor-bolts were to extend vertically downward 5 to 6 in. through 2-in. tubes to a pocket washer 8 in. square bedded in the pier, there being four anchors on each side. Foot-plates for battery posts were not sent, the manufacturers having designed a post extending below the top of the mortar pier to an 18-in. streak-sill resting on a shoulder of concrete, as shown in the front elevation.

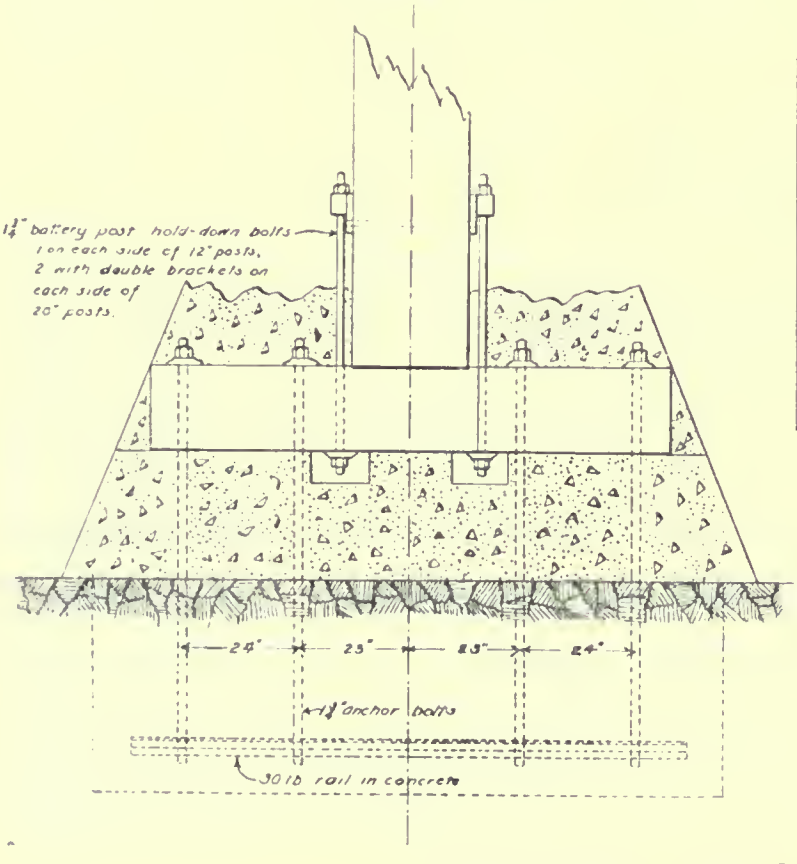
In view of the fact that a well placed concrete founda-

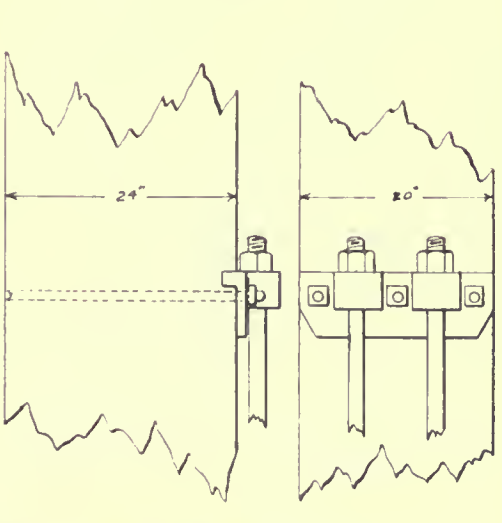


Front Elevation of Battery Foundations.

tion has no limit of life, it was considered expedient to so design all iron and wood-work in connection with the concrete piers that long interruptions, or the destruction and replacement of any part of the concrete-work as the result of breakage, would be unnecessary. To this end the vertical anchor-bolt holes in the mortars were chipped out, the bolts welded out to 7 ft. 11 in., and set diagonally, slipping in a casing; the pocket washers furnished by the manufacturers fitted at the lower end against a straining block set in an easily accessible pocket, and angle-







End Elevation and Details of Battery Foundations.

washers made at the camp with double nuts at the upper end. The piers were enlarged from designs furnished to 6 ft. at the top by 12 ft. at the bottom against 4 by 8 ft., and the shoulder carrying the streak-sill was lowered to 5 ft. 3 in. from the mortar-base.

The materials for concrete were carefully selected; the stone was a hard grano-diorite from the mine-dump put through a Blake crusher set at 1½ in., and was washed free of clay by a hose under pressure. The sand was ordinary river sand, granitic in character. The cement was the best grade of portland. An excess of water was avoided in mixing, and care was taken in tamping to insure a high density for the finished pier. The surface was left uneven over night, and when finally brought to the finished height was not capped with neat cement, but completed with the rough concrete. The piers were then seasoned for three months. The proportions used were as follows:

First	portion	1	cement	1	sand	5	stone for 3 ft.
Second	"	1	"	1	"	4	" " 2 ft. 6 in.
Third	"	1	"	1	"	3	" " 2 ft.

In my opinion this last mixture was richer in cement than was necessary, the 1—1—4 mixture containing sufficient mortar to fill all voids on the 1½-in. run of crusher-rock used.

This mill has been in continuous operation for fifteen months, and has developed only one fault; the anchor-bolts in the streak-sills and battery posts were not heavy enough, and have been replaced by 1½-in. bolts sulphured into the concrete, two bolts being put in the front portion of the streak-sill where there was formerly one. The accompanying sketch shows the changes suggested to remedy the weakness mentioned. The concrete-work has developed no signs of cracking or scaling, and will undoubtedly last many years.

The crushing capacity of the new 20 stamps has amounted to 1.3 tons per stamp-day more than that of the original 20 on wooden blocks, all other conditions remaining the same, over a period of nine months. The breakage of battery parts has been slightly less than in the original mill, and had been so small as to be a negligible quantity. The estimated cost of installing these batteries is about the same as that of a battery with wooden mortar-blocks and the usual type of foundations, amounting to $1,500 per stamp for the completed mill.

THE properties of nickel-steel that recommend it as a material for construction are toughness, great tensile strength, a high elastic ratio, and an ability to withstand to a high degree shock and repeated changes of stress. It is, in addition, of a more uniform structure than ordinary carbon steel, less subject to segregation, and less corrodible. The present limits to the tensile strength of simple steel are the brittleness and want of reliability under shock of the high carbon steels. The addition of nickel increases the strength and ductility of a steel of given carbon content and permits the use of a higher carbon and therefore stronger steel on account of the greater endurance under shock that nickel imparts to the steel.

SHAFT-SINKING.—The No. 1 shaft of the Brakpan mine, in the Transvaal, furnishes a record, for the first sod was cut on May 12, 1905, and by February, 1907, it was 2,002 ft. deep. The hoisting-engines were not on the ground until September 26, 1905, the shaft being then 60 ft. deep. The average has been 114 ft. per month, including all sorts of delays through bad ground, installation of pumps, and other troubles. The maximum sinking was 116 ft. in one month. The manager is Charles B. Brodigan, a graduate of the Royal School of Mines, London.

The Sherman Concentrating Table.

Written for the MINING AND SCIENTIFIC PRESS
By C. EVERARD ARNOLD.

The milling ore from the Daly-West mine at Park City, Utah, is silicious and exceedingly tough, showing masses of galena, pyrite, and zinc blende, a little chalcopyrite, and occasional patches of copper carbonate, its composition being fairly represented by the following partial analysis:

SiO_2	Fe	Zn	Pb	Ag
%	%	%	%	Oz. per ton
68.6	4.0	5.5	4.9	11.7

During the process of milling, in which the ore is subjected to various stages of crushing, screening, jigging, grinding, classifying, and table concentration, there results a product bearing 2% Pb and 9.83 oz. Ag per ton; screening tests on this material showing the following results:

	Per cent.
Passing 80 mesh and remaining on 100	0.3
" 100 " " " " 150	6.4
" 150 " " " " 200	5.8
" 200 "	87.5

In attempting to concentrate the valuable material contained in this product two types of concentrating table were used with unsatisfactory results as regards both work performed and cost of maintenance until the manager of the Daly-West mill, Frederick W. Sherman, devised a table that has been found to meet the requirements of the case, as I shall describe.

In the course of six days, assays were made daily of the feed, tailing, and concentrate, the averages of which are given:

	Pb	Ag
	%	Oz. per ton
Table-feed	2.00	9.83
Tailing	Trace	3.16
Concentrate	10.21	33.93

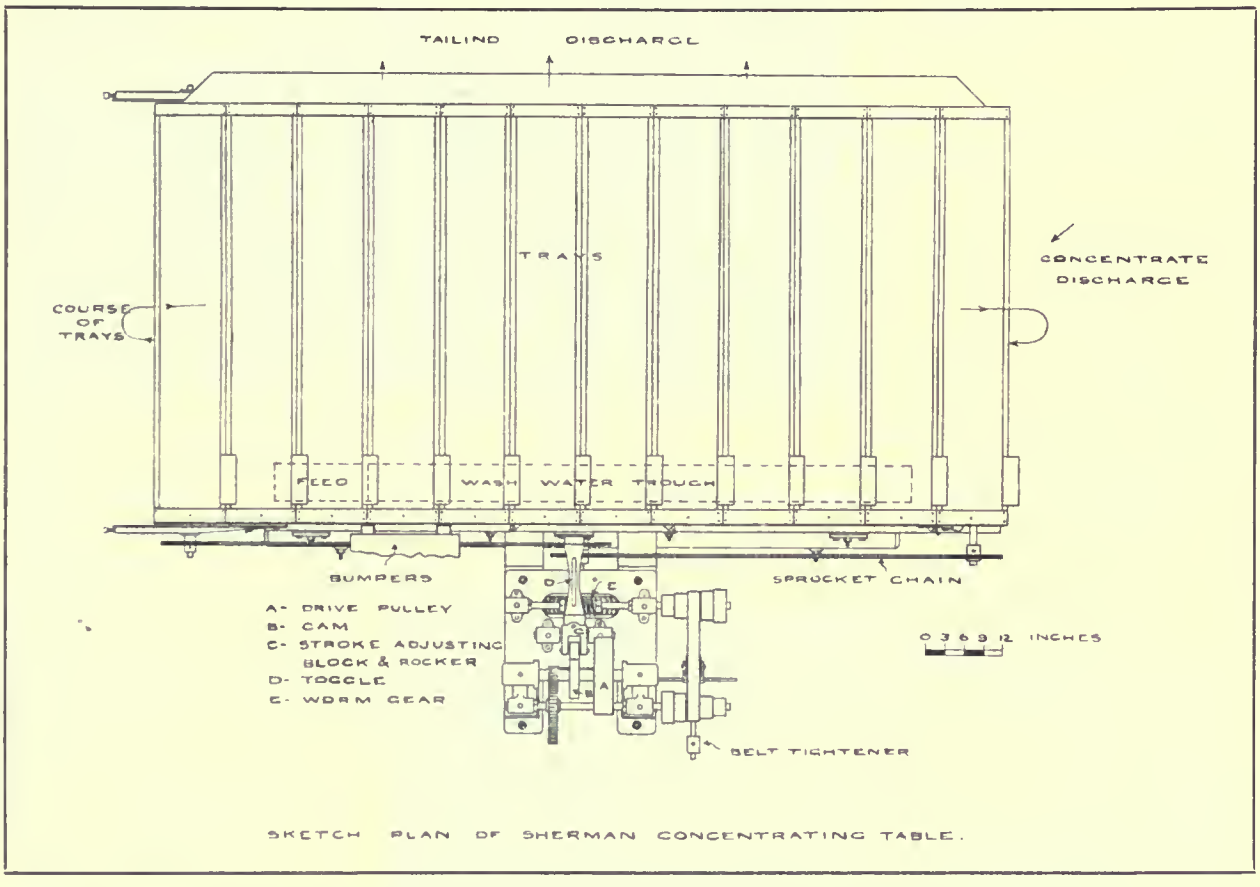
From which it is seen that practically all of the lead is recovered; and, as the table is effecting a concentration of approximately 5 to 1, the silver saving is 74%. Further, it was found that of the silver contained in the tailing, 31.55% was in the form of AgCl and this, as with slimed lead carbonate, it is practically impossible to recover by table concentration. The following are results of a screening test on the concentrate produced:

	Per cent.
Remaining on 100 mesh	Nil
Passing 100 mesh and remaining on 150	0.6
" 150 " " " " 200	0.8
" 200 "	98.6

Regarding the construction and operation of this machine, the concentrating area consists of an endless series of wooden trays (5 ft. 6 in. by 11¼ in.), somewhat similar to those used on the Wilfley slime-table, and these lie with their sides contiguous, the series being given a forward traveling motion, similar to that of a vanner-belt, by means of sprocket-wheels and chains, which are actuated by the head mechanism. In the accompanying plan the head mechanism is seen at the side of the machine, where, in conjunction with two compression-springs, it imparts a lateral reciprocating motion to the table-frame in addition to driving the trays forward. One of the principal features of the table lies in this head mechanism; not only can the length of the stroke be changed independently of other adjustments, but by means of a small 2-in. belt and a series of five pulleys ranging from 4¾ to 3½ in. diam., the rate of travel of the trays (and consequently the amount of treatment of the material) can also be regulated. This belt is held tight on its drive side by means of a lever and suspended weight, which safety device immediately causes the belt to slip if by any chance the travel of the trays is hin-

dered, thus precluding the possibility of a serious breakdown from that source.

The feed is delivered to the trays over a distance of 12 inches only along the table, and at this end of the machine the frame can be adjusted so that the trays receive a slight inclination, usually of about ⅜ in. per foot, the open end or foot of the tray at the tailing-discharge side of the table being highest. When the tray passes with its load from under the feed-box it comes in front of the two bumpers situated 12 in. apart and as it reciprocates against these, the heaviest particles of the material are caused to sink to the bottom and stratify, wash-water being meanwhile delivered to the heads of the trays along the table between the feed-box and the concentrate-discharge. After the tray passes the bumpers the grade



SKETCH PLAN OF SHERMAN CONCENTRATING TABLE.

gradually changes to the opposite slope, that is, the head or closed end now becomes the highest, thus enabling the wash-water to carry off the gangue, the final cleaning of the concentrate being effected on the steepest grade. The concentrate is then washed off by means of a spray from a perforated pipe, the tray returning underneath the frame to the head of the table for its next load. The length of stroke can be varied from ¾ to 1¼ in. and the number of bumps that each tray receives will be 182, 226, 270, 314, or 358, according to the speed at which it travels, the drive-pulley making 160 rev. per min. in each case.

This machine in the course of two months has been handling material at the rate of 7.05 tons of solids per day of 21 hours, repairs up to date having amounted to practically nothing; and although one cannot form an estimate of the cost of maintenance on the basis of the results of this one machine, it can reasonably be expected to be low, judging by the small amount of attention necessary when once the correct adjustment has been obtained. On the strength of the showing made by this single table, the Daly-West company has decided to immediately install 12 more in its mill.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The Talc-Schist sent by J. M., of Clovis, Cal., has no value.

The mineral sent by A. & C. from Coahuila, Mexico, is Garnet.

E. F. E., of Paris, Cal., sends the two antimony minerals, Stibnite and Stibiconite.

A specimen of brown andradite Garnet, Quartz, and Calcite carrying Pyrrhotite, Sphalerite, and Chalcopyrite was sent by J. C. H. of Globe, Arizona.

The specimen from Phœnix, Arizona, sent by C. M. C., is black Garnet, specular Hematite, and Quartz.

The rock sent by W. E. L., from Reno, Nev., is a volcanic Tuff stained with the iron mineral Chloropal.

B. C. O., of Olalla, B. C., sends: No. 1, Biotite and Epidote; No. 2, dark-green Hornblende and yellow-green Epidote.

The specimens marked 'Goldfield' are: No. 1, Breccia stained with Hematite. It should be assayed for gold. No. 2, a gauge of volcanic Tuff carrying much Pyrite; No. 3, Andesite.

The specimens from T. N. G. M. Co., Olighouse, Nev., are: No. 1, marked 'White Contact Outcrop' is a volcanic Tuff; No. 2, marked 'Shaft Rock 100 ft.' is an Andesite; No. 3, marked 'Shaft Rock 175 ft.' is an epidote-calcite-quartz rock and is probably an altered Andesite.

Letters of a Self-Made Miner to His New Foreman.—I.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

My dear Tom:

I have decided to make you foreman of the Imalulu mine, and you will please arrange to begin service on the first of the coming month. You will naturally wish to know the measure of authority granted you and what will be expected of you in your new position.

You will have absolute authority over the mine, including the hoist and blacksmith shop, and all men employed therein. You will hire and discharge all men. I expect to make frequent trips through the mine, to take my own samples and keep in close touch with what is going on, but I shall have no orders for any of the men; so you may know there will be no conflict of authority.

I want you to get a force of good men under you—not the kind that requires constant watching and prodding. You may have noticed that the good thoroughbred horse needs but a word to cause him to walk off with his load with a quiet consciousness of power. If you wish to get the same work done by a plug, you must pound him on the back to get fair service out of him. There is just as much difference in men. Take your time to get good ones. We will stand by you if we have to hang up half the stamps in the mill. There is a mine just over the range where they hire every man who comes along in order to keep the mill running. One look at the crowd is enough. We don't want that kind.

You will be able to judge a good many men who apply to you by their appearance and the answers they give to a few leading questions. Take time to satisfy yourself by inquiry concerning any others. You have nothing to lose by the impressions getting abroad that you are particular in putting on new men. Some men 'hire and fire' and there is a steady stream coming in and going out of camp. I would rather it would be said of you: "He's slow about taking a man, but when he puts one on, he's there to stay."

There are several kinds of men you don't want. You don't want the spiritless man. You don't want the habitual rover, the man who never settles down in one place for any length of time. You don't want the great talker. You want a worker, one who is museled well in the shoulders and arms, not in the mouth. You don't want the kind of a man who thinks he knows better how to run a mine than you do—the professional agitator. You will have trouble enough without employing some one to make it for you.

You want men of good habits. I have mucked out after men who thought they could play cards in a saloon all night and do good work in the mine the next day, and I didn't need a car. I could carry out all the ground they broke in my pockets. You want to employ men who are stayers. It takes time to break a new man in to do the work just as you wish it done, and time is money.

I have always found a man who saved part of his earnings a good man to employ. This does not say that men who do not save will not be good men. I have had splendid workmen whose money went from them after pay-day like water through a sieve. That a man does not save is no reflection on his character. The civilized man is known by the grandeur of his wants and when a man doesn't save, it only shows there are other things he prizes more than he does money. This is all right, if the things he values are good in themselves. But some men are exceedingly wasteful and extravagant and such persons in some places in the mine will require your constant care and oversight.

You will be told that if you want good miners you must get Cornishmen. Don't you believe it. No one country has a monopoly of brawn or brains. Of four premium men, not born in the United States, whom I had at one mine, one was a native of Germany, one of Sweden, one of Nova Scotia, and one of Switzerland. There is many a capable, skilled miner among the Cornish, but you will get better work out of your men if they feel that you are not prejudiced in favor of some one nationality, but that you judge every man on his merits, regardless of where he may have been born.

It is a rule of the Miners' Union that all miners must receive the same remuneration, regardless of their being skilled or unskilled; but it is no fault of the Union if you choose to give employment to poor workmen or to men who will cause you trouble. "But," I hear you say, "every mine can't have a force of picked men." Yes, it can, if it so chooses. One must not make the mistake of thinking that in choosing good men every foreman will take the same type. I have seen a force of very superior men gathered by one foreman go all to pieces in a few weeks under his successor. The new man was better educated than his predecessor; he was more intelligent, but he was lacking somewhat in those elements of character that make the born ruler. He thus failed to dominate his men. But he made a good foreman, nevertheless, and had good men under him, but the keen observer would detect that the new men put on were unassuming. They did not have as pronounced an individuality as the men who quit. Then, again, tastes differ in this world. Give one man certain work to do with a team and he will choose the best American horses he can get. Another will think bronchos "just the thing," and a third will take cayuses. For our work I want you to have thoroughbreds. There are plenty of persons who will be satisfied with the men you do not accept and undoubtedly there will be many good men among them. To make a success as a foreman you must have men who find it a pleasure to recognize your leadership. No one can pick such men for you. You must size up the applicants and choose for yourself.

Sincerely yours,

TIMOTHY STRONG.

THE United States Forest Service has been making a thorough study of the influence of moisture on the strength of wood. The results of its investigations show that the relation of moisture to strength follows a definite law. Proper drying greatly increases the strength of all kinds of wood, the amount of increase depending upon the species and the dryness. For example, the strength of a piece of unseasoned red spruce may be increased over 400% by a thorough drying at the temperature of boiling water. Strength decreases again, however, as the wood re-absorbs moisture. Air-dried wood, protected from the weather, and containing 12% moisture, is from 1.7 to 2.4 times stronger than when green, according to the species. Stiffness is also increased by drying. These conclusions, however, are drawn from small-sized pieces, not exceeding 4 by 4 in. cross-section. Large timbers require years of drying before the moisture is reduced to the point where strength begins to increase. More or less checking always occurs when large timbers dry, and if this checking is excessive it may cause enough weakness to counterbalance the strength gained by drying. Consequently it is not safe to assume that the average strength of large so-called seasoned timbers is much greater than that of green or wet ones.

Mining in Honduras.

Written for the MINING AND SCIENTIFIC PRESS
By HORACE G. NICHOLS.

Those engineers to whom the possibility of non-persistence of veins in depth gives an additional zest to their work, will find plenty of scope in Honduras. Such men will not be dismayed by sudden set-backs in the course of development from pushing their work to a logical conclusion.

Porvenir Mine, 40 Miles From the Coast.

The truth of such a characterization will be more fully appreciated after experience with a number of abandoned mines, which are monuments of want of persistence, in men, rather than veins.

The country consists essentially of plutonic and volcanic rocks, but these are often so altered as to produce metamorphic varieties requiring care in classification. Not much prospecting work has been done really deserving of the name. The richest parts of Honduras are as yet all but unknown. The northern interior is not easy of access, and, in spite of excellent specimens, rich in copper and gold, that are continually being brought from that region, a mine able to pay its way from the first strike of the pick has yet to be found and the capital required during initial stages of development has not been forthcoming. Some instances there are, however, where there has been no lack of funds provided, and, in such instances, returns have not been wanting; but too much has been left to native work and haphazard methods. More systematic prospecting is wanted, conducted by qualified men.

There are too many prospectors of an irresponsible class to whom the work of exploration has been committed; they have damaged the country's reputation by their facile way of explaining their inability to follow a faulted vein, by referring to it as "another of those wedge-shaped surface veins."

Numerous examples occur, in old Spanish workings and others of more recent date, of want of persistence and lack of technical knowledge, combined with unpreparedness for dealing with the inevitable conditions, where abandonment has suggested the non-persistence of the ore deposits.

In one mine, a bonanza had been worked to a depth of about 200 ft. from the surface, where it came to an end between two converging faults. On the upper levels it had been worked for a length of 150 ft., with excellent results; but, although it was apparent that this orebody was included between the two faults, no attempt was made to look for the vein on the other side and only when the end of the ore had come, was the necessity for prospecting realized. In this case it was found, after passing through the fault, that the whole country had been shifted by three successive movements and the vein was actually thrown for over 300 ft. The final fault-movement presented some interesting features. The vein, having a north-south strike, and dipping 50° E, had been cut off on the 100-ft. level by a fault, which may be called No. 1, and which had a strike N 80° E and dip 80° NW. Prospecting showed no continuation of the vein on the north side of this fault for 80 ft. east and west. A cross-cut, however, on the 200-ft. level proved the continuation of the vein beyond this fault and but slightly dislocated. Upon driving north for 60 ft. on this portion of the vein, a second fault with strike N 65° E and dip 48° NW again cut off the vein. Associated with all the workings was a third fault, No. 3, striking N 27° E and dipping 56° NW which was well-known as producing but a slight throw of the vein, and in every instance where this fault had been encountered in the stopes, intersecting the vein, a small cross-cut to the east on the north side of the fault was sufficient to pick up the vein again. Just before meeting the No. 2 fault this No. 3 fault had again been encountered and passed through. The No. 1 and 2 faults came together just above the No. 1 level on the line of strike of the vein. Although the reason for the existence of the vein between the No. 1 and 2 faults on the No. 2

An Example of Native Mill-Construction.

level—while there was no trace of it on the No. 1 level beyond the No. 1 fault—was not understood, a cross-cut east was driven on the No. 2 level after driving north from the No. 2 fault some 40 ft. and matters were apparently still further involved by encountering in this cross-cut the No. 3 fault, in such a position as indicated a very small throw from its old line of strike. It was realized that something more than a mere lateral movement must have taken place, inasmuch as the No. 3 fault had already been passed through at its intersection with the vein upon this level, and therefore it was to be expected that at any point north of this intersection, the vein should certainly be cut first, in going east. A close study of the ground in a small cross-cut that had been made just beyond the intersection of the vein and the No. 3 fault (where the No. 2 fault was first found) showed an appearance on the under side of the No. 2 fault, suggesting an extensive upward sliding movement, 'fraying' the rock on the under side of the No. 2 fault, and in following this out, it was seen that several conditions might be explained. In the first place, the vein dipped east and therefore in being raised vertically from a lower level it would come into a position relatively east to its position upon a higher level. The No. 1 and 2 faults came together just above the No. 1 level, and so the ground between them upon this level was so broken and disturbed that no continuation of the vein was found in place, but the 'drag' was found along the line of fault to the east. Below, on the 200-ft. level, with the 60 ft. of ground between the faults, the vein, although much shattered near the No. 1 fault, continued still. Next, the finding of the No. 3 fault before the vein in the east cross-cut was explained, for, as both it and the No. 2 fault dipped NW, its apparent throw by an upward movement of the ground on the latter fault would of course be far less than the apparent throw of the vein, which dipped 50° east, and it was calculated from these considerations principally that all the ground on the north side of the No. 2 fault had been brought up from a vertical depth of about 150 ft. and this would call for a further distance of 200 ft. to be cross-cut beyond the No. 3 fault in order to get the vein. This work was done and the vein was found, thereby affording most useful data for the prosecution of work below this lowest (200 ft.) level. On this property, surface workings over a distance of 2,000 ft. have given some excellent results and point to a continuance of the main vein, but in territory divided by disturbing faults of such frequency and magnitude as to make an extensive system of preliminary underground development essential to economic working of the mine. The bonanza, mentioned above, carried some ore as rich as 10 oz. gold per ton, and was characterized by plentiful sulphides. Often no 'color' was obtained in panning, but a free-milling extraction was obtained on the plates, 81% being obtained from ore carrying over 7% concentrate, which accounted for a further 9.5% extraction. Owing to some copper in the tailing, the economic treatment of the residue was not undertaken.

In this particular instance the situation was saved by the plucky persistence of an English company, which owned the property; but this is an excepton to the general rule obtaining in the country, for, in most instances, by trusting to native guidance, the necessity for energy in pushing development work is entirely lost sight of, and the first fault to affect the vein and baffle the skill of the native mine foremen, sounds the death-knell of the mine. In only one mine in the whole country has an orebody been prospected to a depth of over 500 ft., and in that case the results have beeu eminently satisfactory.

The fallacy of trusting to native methods is strongly demonstrated in the case of another group of mines known to me. In these work had been done for twelve or thirteen years without having recourse to proper technical advice. Reports were made showing the cost of mining to be about $15 per ton; upon this were founded estimates of great possibilities and money was freely supplied. From time to time accounts were rendered, which, while admitting no profit, showed that the cost of working was well within the prescribed limit and every bunch of ore that gave good returns was brought forward as typical evidence of progress and a just foundation for expectations. Assays were made occasionally, and the best were always reported. A day's work was taken as typical of a month's operations and a mill-run for a few hours made everyone happy, so that a cablegram was despatched to the effect that the mill was working splendidly, and from reading these reports, which from the native standpoint were a representation of the actual operations, the idea was conveyed that strenuous efforts were being made, the concern being worked upon a scale that sooner or later must produce results in accordance with the promise suggested by the rich pockets.

The reality was in painful contrast. The actual tonnage milled altogether was but 2,000 tons. A network of drifts and cross-cuts at intervals of 30 ft. and less honeycombed the vein where it was easily accessible from adits and a shaft, upon which all energies should have been bent from the outset, was abandoned on account of water. The actual value of the ore milled was no more than $12 and the net loss per ton was well over $80 in operating expenses alone. Thls whole condition of affairs was brought about by no willful misrepresentation, but was due to lack of appreciation of the vast difference between what really constitutes a mine and the idea of a mine as conceived by those to whose philosophy provision for the future is, and always has been, foreign.

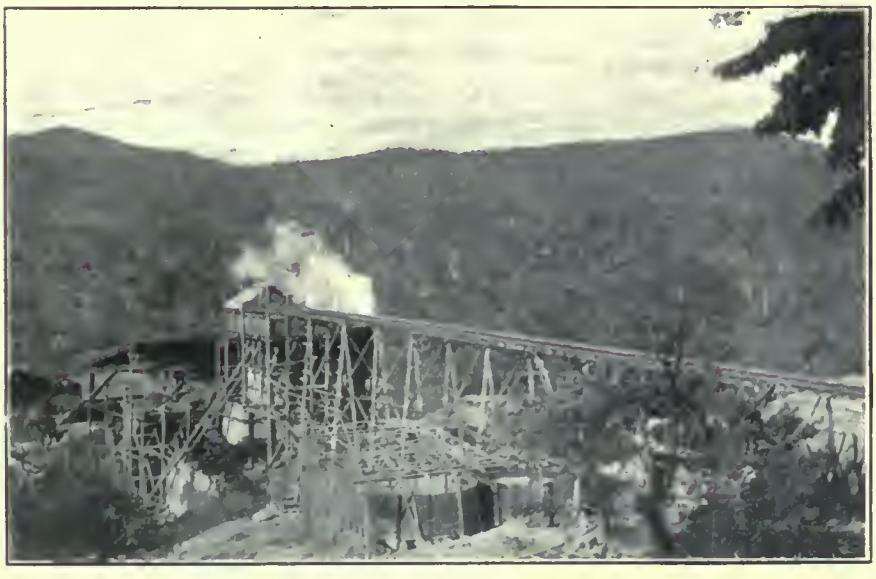
In another mine near the West Coast, in a country characterized by rhyolite and basalts, a strong vein of clean quartz is broken at the surface by an intrusive body of eruptive rock for a distance of 1,000 ft., continuing on either side with a bold outcrop. On each side of this break for 400 to 500 ft., there is a curious transverse banded structure, the quartz in places being banded with silicified rhyolite. The ore in this vein appears to have a close relation to the proximity of this intrusion, a marked improvement being noted at the intersection. The present workings of this mine are down to sea-level, and, so far, the quartz is much honeycombed, and no indication of any economic results of this leaching have been observed. This vein is about 15 ft. wide, and carries gold and silver, making a low-grade ore. It is mentioned as instancing the possibility of good results with proper management.

It is often stated that labor is cheap in Honduras. It would be more correct to say that laboring material is cheap, and with proper supervision can be utilized to do cheap work. The want of application, of steady purpose, in the native character makes itself felt in no way more forcibly than in the efficient consummation of mining work requiring skill and persistence in its execution, and this is especially so in such work as is foreign to the time-honored ideas of the country. On the other hand, given a satisfactory organization and proper handling of the men, where provision is made for providing the necessary guidance in all details, there is no doubt cheap work can be done.

The native lives from hand to mouth, and is disinclined to recognize any inducement beyond his immediate needs. It is said that this is due to political conditions, but in this matter, as also in the encouragement of the sale of native liquor, out of which the Government draws one of its principal sources of revenue, the mining economist, seeking to improve mining conditions by

striking at the root of the evil, will do well to remember the Spanish proverb, "*Del mal el menos.*"

It is common to be told in Central America that before it is possible to do anything, the customs of the country must be observed, that all ideas of getting anything more out of the natives than that to which they are accustomed, must be abandoned, and that one must learn to adapt oneself to the easy-going round of tropical existence. On the contrary, I believe that while using to the full all advantages to be secured by native help, if success is to be achieved a struggle must be maintained to lead, not to follow, in the way taught by experience elsewhere. As a certain class of freight-cars may be more adaptable to a particular kind of freight, so is the native best suited to manual work in the tropics; but it is not more futile to expect those freight-cars to travel across the continent without a locomotive than to expect to succeed in mining here by leaving the prosecution of the work to native hands. If it is stated that no white man can long stand such a strain, then let it be for a short time, with opportunities provided for periodical recuperation.



The Mill of the Transito Mining Company.

Approaching the question of costs, it becomes difficult to make any statement in average figures. Conditions vary so much in different parts of the country, and even in the same place at different periods of the year that in a community where mining is not looked upon as a steady pursuit, the hire of labor suffers from many fluctuations. It is, however, possible to state within reasonable limits the average cost per day for the different classes of workmen, miners, shovelers, mechanics, etc., but when it becomes a question of figuring from such data the cost per foot or per ton, a difficulty arises. This, perhaps, cannot be better described than by stating the cost in specific instances.

A shaft 8 by 14 ft. was being sunk vertically as the first step in developing a mine near the West Coast and the cost of sinking was 15 *pesos* or $6 per foot without timbering. The rate of progress was 5.5 ft. per month. As it was essential that this shaft should be sunk 100 ft. vertically within three and a half months, arrangements were made and inducements were offered for expediting the work, but directly the natives saw that they were wanted to work, trouble began. The work was done but at a cost, without equipment, of over $50 per foot. Thus it will be seen that the time factor is of prime importance.

The necessity of doing a little work occasionally is recognized among the natives for the supplying of their modest wants and they are accustomed at odd times to hire themselves for making fences, sowing corn, etc. The pay for such work among themselves is very small indeed. Take the case of the construction of fences around corn patches. A good form of native fence is made with rough branches supported on forked posts at one end, the other end resting on the ground. When well made these fences will last for some time. The ordinary day's task in such construction is 24 *varas* of 33 inches in length, the fence being about four feet high. A day's pay is at the most 75 *centavos*. The cost becomes approximately one *centavo* per running foot or 250 ft. for one gold dollar. Let, however, a foreigner hire labor for the construction of a post-and-rail fence or any other kind, not known to the native, and the price will be very different indeed; and so it is with mining. In the case of the shaft mentioned above there had been no pressure brought to bear to hasten the work and no regular gang was kept employed. The native foreman in charge was content to depend upon such promiscuous applications for a day's or half a day's work as might chance be made to him, with the result as stated. Immediately, the aspect of the undertaking was altered and instead of offering a convenient opportunity to earn a few cents as desired, the work was regarded as a hardship for which extra compensation was needed. This disinclination to commit themselves to more work than they may feel inclined to do at any time is also

Cyanide Plan at the Transito Mine.

shown by another instance in which a contractor was offered a higher rate per foot for sinking a shaft should he exceed a certain footage per month. He refused the offer and at the end of the month he had accomplished in his own way exactly the limit specified. It will be seen then that the cost of an undertaking will depend entirely upon supervision and organization and the capacity for using to the best advantage the class of labor available. Such labor costs about as follows: Miners, 1 *peso* per day; shovelers, 50 to 75 *centavos;* mechanics, 1.50 to 3 *p.*; firemen, 1.50 *p.*; blacksmiths, 1.50 to 3 *p.*; timbermen, 2 to 2.50 *p.*; carpenters, 2 to 2.50 *pesos.*

The native master-mechanic or mine-foreman is not recommended. The instance already quoted sufficiently describes the irregularity of which such men are capable, perhaps unintentionally, but none the less productive of immense confusion, and, if allowed to go on, disastrous results. A case came under my notice in which a contract was let for driving a tunnel. The cost was reported as being $3.50 per *vara*, or yard. The unreasonableness of such a cost leading to close investigation, elicited the information that as a matter of fact this particular piece of work was costing $27 per foot, the difference being caused by sundry allowances for a missed hole, perhaps, or a piece of hard ground, or delay in laying the track, or almost any trivial excuse, the excess being cheerfully charged to 'mine expense,' or some other sink for promiscuous expenses.

Undoubtedly, what is required is to strike the happy medium by providing foreign shift-bosses to direct the working of gangs, and able to provide what is lacking in foresight and persistence while using the labor that the country provides.

Prospecting during the greater part of the year in Honduras is not attended with as much difficulty on account of vegetation as might be expected. The duration of the 'dry' season varies with the locality, but as far as the western portion of the Republic is concerned, it may be said to commence in November. No new vegetation commences to grow much before July.

The timber and water supply also varies considerably in different parts of the country. Where wood is plentiful, it can be had at a reasonable cost, and makes good firewood. Where it has not to be hauled for more than a couple of miles, the cost delivered at the works is not more than about $1 gold per cord. The native cord is equivalent to about 0.6 of a standard cord, making an equivalent of about $1.60 gold for a standard cord.

Many of the native woods fit for fuel make excellent mine timber, but, where the difficulties of access are not too great for construction purposes, it is more economical to import lumber on account of the great hardness, and difficulty of working, the native timber.

On the whole the climate is not altogether unhealthy, and with proper care, good living, precaution regarding mosquitoes, drinking water, and getting wet, there is but little fear of serious illness in the worst parts; in the hills the climate is delightful, though hot in the middle of the day.

MINERALS AND PRECIOUS METALS are said to abound in Roumania, but thus far only salt and petroleum are obtained. The petroleum industry is advancing rapidly and will probably become one of the most important sources of revenue. Large tracts of supposedly petroliferous lands are as yet unexploited, and other sections are only just beginning to be worked. At present the production of petroleum is chiefly from the district of Prahova. There is said to be $30,000,000 capital invested in this industry, mostly by German, Dutch, French, Italian, and American interests.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A demand made by a miner to the drivers for props, on several days prior to the day of the injury by the fall of a portion of the roof of the room of the mine in which he worked, was held to constitute a sufficient demand on the mine manager as required by statute, where it appeared that the mine manager had instructed the miners to make requests for such props direct to the drivers, with whom they came in direct contact, it being inconvenient on account of the size of the mine to make such request to the mine manager in person.

Donk &c. Coal & Coke Co. *v.* Lucis, (Ill.) 80 N. E. 560. (Feb., '07.)

A miner whether working as a servant of the mine operator, or working in the mine by invitation, is held to assume the risks incident to such work; but increased risks caused by the negligence of the operator are not regarded as incident to the business, and are not assumed by the miner.

Birmingham Min. &c. Co. *v.* Skelton, (Ala.) 43 So. 110. (Feb., '07.)

A gift of a certain sum of money to the governor of a province in Panama to pay his expenses to the capital to confer with the president of the State, concerning the grant of a mineral concession to the persons furnishing the money, would not be the use of money for an unlawful or immoral purpose; and especially where the agent of such persons furnishing the money was advised that the president of the State made it a rule not to grant a mining concession in an outlying province without having first personally consulted the governor of the province.

Allen *v.* O'Bryan, 103 N. Y. Supp. 125. (March, '07.)

A mine owner is not relieved from liability for his neglect to perform a statutory duty to prevent the accumulation of dangerous gases, which led to an explosion, because there was another efficient cause contributing to the accident for which a recovery could not, under the declaration, be had.

Wilmington Star Min. Co. *v.* Fulton, 21 Sup. Ct. 412. (March, '07).

In an adverse suit to determine the title to a mining claim the rules governing ordinary ejectment suits, that mere prior possession shall constitute a basis for recovery, does not apply, but the rule is that the defendant, as the plaintiff must recover on the strength of his own title. And the Land Office is not bound to recognize the finding of a court for a defendant, unless it be upon proof of right of possession; and any local court which proceeds in defiance of this condition simply imposes on the litigants the probable penalty that the Land Office will not regard their conclusions thus reached in disregard of the Act of Congress. All the finding that the Land Department asks from the Court is: "Who, upon the merits, has the right of possession?" All other findings are said to be superfluous and an invasion of the jurisdiction of the Land Office; this is true because "it remains in every case for the Land Department to determine all other questions touching the right of patent."

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

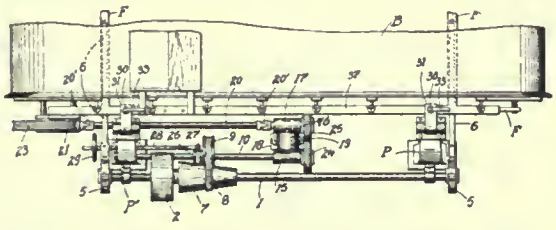
A forfeiture of a mining claim for failure to do annual work can be established only upon clear and convincing proof of such default proved against the former owner by the party assailing his title. But where the owner has failed to make and file the proof of labor required by statute, such owner was held not entitled to invoke this rule, for the reason that the statute places the burden of proof upon him to show that such work has been done according to law, and not upon his opponent to show that it has not been done.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

MINING AND METALLURGICAL PATENTS.

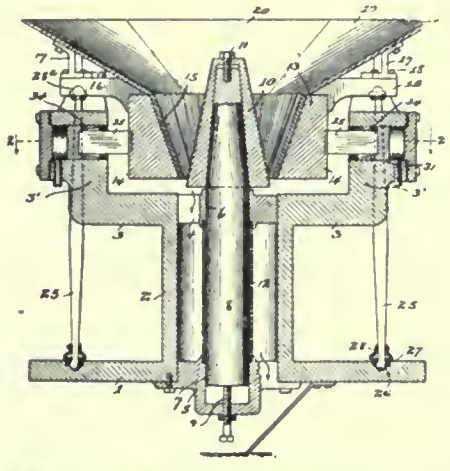
Specially Reported for the MINING AND SCIENTIFIC PRESS.

VANNER.—No. 850,415; George O. Bradley, Salt Lake City, Utah.



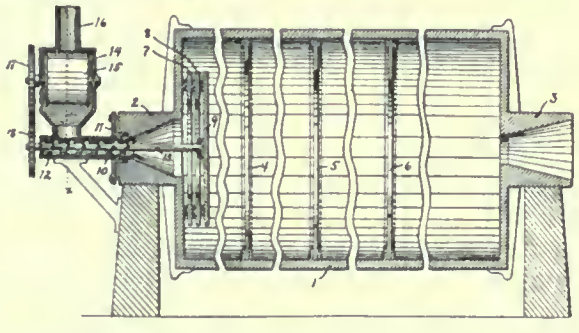
In a vanner, a drive-shaft, a cone-pulley carried thereby, a second pulley co-operatively connected thereto, a shaft for said second pulley, capable of oscillation about a fixed point, a jointed shaft located adjacent to said oscillating shaft, and having a section capable of conjoint oscillation with the oscillation shaft, intermediate gearing between the oscillating and jointed shafts, located contiguous to the point of oscillation of the shafts, a vanner-belt, and suitable gearing between the jointed shaft and belt for imparting motion to the belt.

GYRATORY CRUSHER.—No. 850,491; Oliver C. Redding, Chicago, Ill., assignor of one-half to William K. Kenly, Chicago, Illinois.



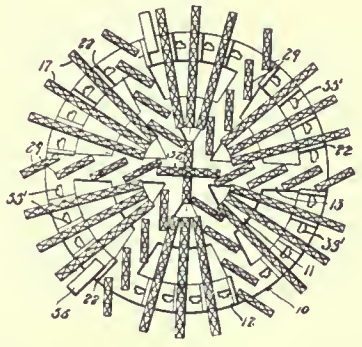
In a gyratory crusher, the combination with a central crushing-head, of a surrounding crusher-jaw supported to move bodily in a plane perpendicular to the axis of the central crusher-head, and means for gyrating said surrounding crusher-jaw member in its said plane of movement.

PEBBLE-MILL.—No. 849,730; George S. Emerick, Nazareth, Pennsylvania.



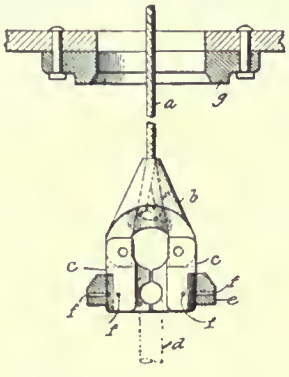
In combination in a pebble-mill, means for separating and feeding material into said mill, consisting of a feed-spout delivering upon a feed-roll, an inclined screen in close juxtaposition to the surface of said feed-roll, a tailing-spout, a worm-casing and a worm adapted to rotate therein, and means for reducing the material fed into said mill, said means including a plurality of transverse, annular flanges progressively increasing in depth from the feed to the discharge end of said mill, whereby the passage of material through said mill may be retarded.

TUNNELING-MACHINE.—No. 848,107; John P. Karns, Boulder, Colo., assignor to The J. P. Karns Tunneling Machine Co., Boulder, Colorado.



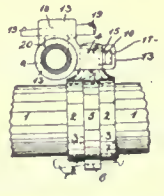
In a tunneling-machine, the combination with a revoluble bit-carrying head, of a rifled shaft connected thereto, a casing surrounding the shaft at a point adjacent to the head, and having diametrically opposed projecting arms, jack-screws arranged in the arms and designed for engagement with the tunnel-wall, a ratchet-wheel arranged within the casing, and having an opening for the passage of the rifled shaft, and a pawl carried by the casing and engaging the ratchet-wheel.

DETACHING-CONE FOR MINE AND OTHER ELEVATORS.—No. 845,177; George Killian, Scranton, Pennsylvania.



In a device of the class set forth, a hollow cone in which is adapted to be secured the lower end of the hoisting-cable, a pair of depending jaws pivotally attached to the lower end of the cone at opposite sides of the hole in the same, the lower ends of these jaws being adapted to swing outwardly, and their inner faces being adapted to receive and engage the cage-hanger, a ring or band surrounding the jaws at their lower ends and serving to hold them in engagement with the cage-hanger, frangible pins fastening the ring to the jaws, in combination with a stripping-ring supported above and in line with said ring or band.

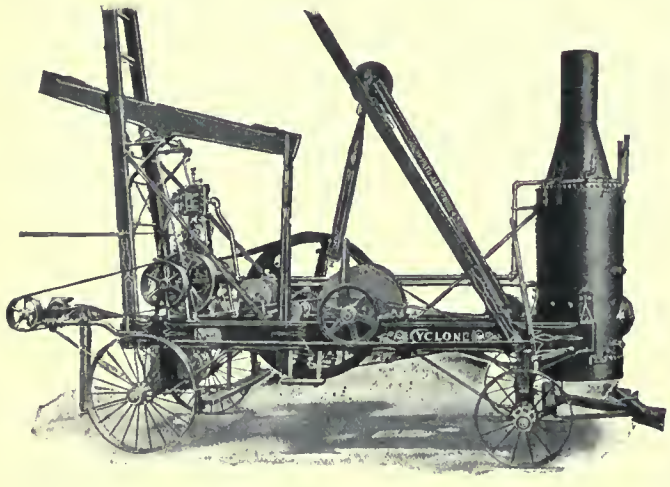
MEANS FOR MOUNTING ROCK-DRILLING MACHINES OR ENGINES.—No. 850,885; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



In means for mounting a rock-drilling machine or engine, in combination, an engine-clamping means comprising a pair of sleeves surrounding the machine or engine, a third sleeve disposed between those already named and also surrounding the machine or engine, a key engaging all three sleeves and adapted to pull the last-named sleeve in a direction opposite to the pull upon those first named, and a column-engaging projection secured to said engine-clamping means.

A Combination Prospecting Drill.

Within the past year a complete combination drill has been placed on the market handling core, hollow rod, and cable tools, or any two of the systems. This machine has been perfected to meet a demand where the conditions cannot be well met with one tool equipment, or where the character of the formation is not known. The drilling elements employed are in no way an experiment, but the design and construction of the machine make it possible to operate any of the systems successfully, and this appeals strongly to the experienced prospector, who has encountered conditions with one type of drill that proved a failure, while the proper equipment to meet the particular conditions could have been highly successful. The cost of the drill-work can be reduced in many instances; it may be desired to obtain



cores of strata at considerable depth, and simply a record of the depth, thickness, and character of the overlying strata; the drilling can be started with the churn-drill, which brings the material out in cuttings, and continued down to a point where it is desired to obtain cores; the core attachment is then put to work and cores removed, getting the same practical result as by using a core-drill from top to bottom, yet at a great reduction in cost as compared to core-drilling had the core-drill been used from top to bottom; also on ground where bedrock lies at great depth, and a large amount of soft material must be passed through, or the material is badly broken, as is the case in many places. There are no tools that will work so successfully in this kind of material as churn-drills of the hollow rod or cable type. A purely core-drill is not so well equipped for driving and pulling long strings of drive-pipe as is the churn-drill; neither will it drill so rapidly in soft formations, such as shale or similar material. Holes can be sunk rapidly with these equipments and much time saved, which is frequently of considerable importance. The outfits are built in a number of sizes and styles, with various equipments to meet the conditions prevailing in various localities. They are built by the Cyclone Drill Co., of Orrville, Ohio, in connection with their standard well-drilling and prospecting outfits.

Trade Treatises.

THE CHROME STEEL WORKS, of Chrome, N. J., has issued a new catalogue describing the Canda tempered steel jaw plate for crushers; also chrome steel wearing parts for cement-grinding mills. We have also received a particularly handsome pamphlet describing the Canda self-locking cams, tappets, and boss heads, under the title of 'Stamp Mill Parts.'

Technical Schools.

We have received the *Quarterly* of the Colorado School of Mines, containing views of the college buildings at Golden, and field-trips of the students.

Commercial Paragraphs.

THE MOUNTAIN COPPER CO. has removed its offices from Oakland to 150 Pine St., San Francisco.

ROBERT W. HUNT & CO. have moved their offices from 66 Broadway to the new West St. Bdg. at 90 West Street, New York.

THE GENERAL ELECTRIC CO. states that its executive office for the Coast will be henceforth on the tenth floor of the Union Trust Bdg., San Francisco.

J. S. WATSON, manager of the Link-Belt Co.'s drive-chain department, sailed for Europe on April 25. While abroad Mr. Watson will visit the chain-making plant of Hans Renold, at Manchester, England.

THE RICHARDSON SCALE CO., of New York, makers of automatic weighing scales, have removed from the Park Row Bdg. to No. 3 Park Row, where more room, necessitated by their greatly increased business, is available.

THE San Francisco office of the GENERAL ELECTRIC CO. is now in the Union Trust Bdg. Since the fire, the office has been in the Union Savings Bank Bdg. at Oakland, large temporary warehouses having also been erected in the same city.

THE MIDVALE STEEL CO. of Philadelphia, Pa., announce that on May 1 they moved their general sales office for the Pacific Coast to the Monadnock Bdg., San Francisco, where they will be permanently located hereafter. Jas. C. H. Ferguson is Pacific Coast sales agent.

THE RICHMOND MACHINE & IRON WORKS is a new company that has established a large and well-equipped machine-shop at Richmond, in Contra Costa county, California. Richmond is situated on deep water at the terminal of the Santa Fe railroad, with spur tracks from the main line of the Southern Pacific.

THE MINNEAPOLIS STEEL & MACHINERY CO. has opened a branch office at 262 Commerce St., Dallas, Texas, under the management of J. P. Greenwood. The large demand for Twin City Corliss engines and Muenzel Producer gas engines in this territory made it necessary to open an office in that State, so as to take care of the increasing business.

THE RISDON IRON WORKS is making an improvement on the Johnston concentrator, and it is known as the new Standard Johnston machine. A large number of them are in use in the big mills of the Utah Copper Co., and the Boston Con. Copper Co., in Utah. This new Johnston machine is considered one of the best tables on the market.

THE INGERSOLL-RAND CO., 11 Broadway, New York, has issued a booklet of 20 pages, with 11 illustrations, describing the new Temple-Ingersoll electric air-drill. This novel device not only completely solves the problem of employing the electric current in the driving of rock-drills, but avoids entirely the conditions that make the successful employment of the electric-drill impossible. The drill is air-operated, with advantages of its own, especially in the increased force of the blow struck and the great saving of power.

Catalogues Received.

GEO. E. WOODBURY, of San Francisco, Cal., has just published Bulletin No. 1, on the 'New Woodbury Concentrator.'

THE C. O. BARTLETT & SNOW CO. of Cleveland, Ohio, is mailing to the trade Catalogue No. 16, concerning Mechanical Dryers.

THE ALLIS-CHALMERS CO., of Milwaukee, Wis., has issued Bulletin 1,423, describing Gates breakers with short head and concaves for fine crushing.

THE CYCLONE DRILL CO., of Orrville, Ohio, has issued a 100-page catalogue describing its prospecting machinery for use in coal, water, oil, gas, mineral, and placer mining.

The Jeffrey Manufacturing Co., of Columbus, Ohio, sends us illustrated catalogue No. 57 B, describing Jeffrey conveying machinery for sawmills, lumber mills, and wood-working industries.

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Editorial.

A CONFERENCE of the heads of the State Geological Surveys has been called by Mr. George Otis Smith, the director of the United States Geological Survey. This conference will take place at Washington on May 20, and it is likely to become a regular event, having been found to be most useful. The subjects to be discussed include geologic, hydrographic, topographic, and statistical work. In Colorado the legislature has passed the bill for a State Survey, and Mr. R. D. George has begun work on a revised geological map of the State.

COBALT has a local branch of the Canadian Mining Institute; it has started with 50 members. A. A. Cole is chairman and George D. Hardy is secretary. The first meeting was devoted to a discussion of the paper by Mr. C. R. Van Hise on the local ore deposits and some excellent observations were submitted by those present. We wish this young institute every success in its useful work.

BY ITS SECRETARY, Mr. Charles D. Walcott, the Smithsonian Institution has invited the National Academy of Sciences and the American Association for the Advancement of Science, to make the Smithsonian Institution their headquarters. The invitation suggests that they deposit their archives and records in rooms provided for the purpose. The secretaries of the two organizations have accepted the kind offer of the Smithsonian and these three national scientific societies will now be gathered under one roof, enabling the Smithsonian Institution to achieve the purpose of its founder, James Smithson, namely, "the increase and diffusion of knowledge among men."

LASSEN COUNTY has "a soap mine;" so says the *Chronicle*. Two prospectors found a deposit of soapstone, several feet thick, which "is thought to come from the decayed bones of fish." It is "also said to be antiseptic in character." This is an excellent sample of newspaper science. However, we rejoice, for now Lassen county can have a new motto: "While there is life there is soap." Possibly the altruistic population of Lassen will send a few carloads of its soap to wash the blot from off the escutcheon of San Francisco. We need soap, especially one that is "said to be antiseptic."

ON FRIDAY LAST while the tramway officials were trying to run one or two cars in San Francisco, by the help of an inadequate police force, the following incident occurred, so says the *Chronicle*. "On Oak street an old couple appeared in an open window and waved American flags as the crews passed. The cars stopped and the crew raised their hats. The man, who must have been 70 years of age, lifted his voice and

shouted: 'May God grant that this flag will ever protect you in your desire to sell your labor at any wage you choose to accept.' The crowd cheered and the cars started on." Those cheers will echo in the hearts of many who read the account. For 130 years that flag has stood for equality of opportunity and essential manhood.

GOLD MINING IN ENGLAND has been something of an iridescent dream and now our London correspondent tells us of a big lode of gold-bearing conglomerate found in the Forest of Dean. The speeches made to the shareholders remind us of similar orations that tickled the fancy of the inexperienced in the days of Rameses. Apparently a deposit of conglomerate containing gold must necessarily pay if there is enough of it, but there is the corollary that if the stuff is too low-grade the larger your scheme of operations the bigger your loss. Ore that does not pay is no better than beach sand. There is gold in sea-water and there is heat in moonlight. The assays given by the Chastan Syndicate do not look enticing, for it is a brutal fact that the recovery in the mill is usually less than the assay.

Gold Mining in Egypt.

UM RUS, the ancient gold mine in Egypt that was re-opened by an English company, has been closed down, and the company has gone into liquidation. The first ore produced averaged an ounce of gold, but deeper development has proved disappointing. There are 6,000 tons of ore in the mine that will average 12½ dwt. per ton, but this cannot be extracted at a profit. Such a result gives point to an exclamatory paragraph in a letter received by us this week from Egypt, from a mining engineer, who says: "Why is it that people think that this desert country with its crumpled hills and sandy plains, that has been searched for gold for several thousand years, by prospectors as keen as any that ever lived, should be an untouched Golconda?" Well, those who thought so, know better now, for gold mining in Egypt is a dead industry. It owed its renaissance to fortuitous circumstances, among which the connection of an honored firm of mining engineers and the interest of a prominent South African capitalist were the most notable. If the modern speculator has not been enriched, at least he has learned something of archeology. On one mine two inscriptions have been found in Arabic dating back 819 years. The country was prospected by the early Egyptians and Phenicians, later by the Romans, and then by several generations of Arabs. The original grinding machine, back of the *arrastre* and Chilean mill, was probably invented in Egypt and carried by the Romans into Spain, whence Hannibal got the gold needed for his campaigns; by the Spaniards this forerunner of the *arrastre* was taken to Mexico and South America. Apparently the primitive metallurgy of the ancient world sufficed to extract most of the precious metal, for the best talent has failed to find much of it during the recent Egyptian boon. They have an Inspector General of Mines in Egypt now, and that sounds worthy of the Pharaohs, but despite this impressive officer and the expenditure of several million dollars, there is no profitable gold mine in Egypt today. The Nile Valley Company had a pyrotechnic career on the London stock market, and it is now trying to find ore. Um Rus, after being "shut down for 2,000 years," was re-opened by a company that was subsequently re-constructed, and is now to be liquidated. It costs $35 per ton to transport material 200 miles, labor is inadequate, water is scanty, and gold is scarce. That is why gold mining does not pay in Egypt.

Rampant Individualism.

INDUSTRIAL CONDITIONS in the mining regions of the West are likely to suffer from the action of the operators at Goldfield and Tonopah, particularly the former. At the present time miners get $5 per shift at Goldfield and $4 at Tonopah. When working in shafts, wages are 50 cents more, so that $5.50 is paid to men engaged in sinking. Workmen on surface get $4.50 at Goldfield and $4 at Tonopah. As the two towns are about thirty miles apart, the result is to draw miners to Goldfield from Tonopah, and to Nevada in general from the other mining States. Every man is entitled to the wages he can get and an operator is entitled to make his own terms with his men. But there are limits to this freedom of contract, for behind the individual is the community that gives him legal protection and the opportunity to perform his work. To that community the individual is always beholden. In the case cited, we believe that the anxiety to extract rich ore at any cost, in order to support a weak stock-market, is likely to subvert industrial conditions and to injure the community as a whole. Of course, we are aware that there is an alleged humorous side to this subject, for it is said that the miners drop most of their high wages in the gambling establishments controlled by several of the mine-owners, but as a matter of fact only one or two of the operators have such facilities and the chief reason for the exorbitant rate is the haste to extract ore of unusual richness. Everything is subordinated to this. The lessee wants to extract the maximum amount of ore during the term of his lease, the lessor has his eye on a top-heavy stockmarket and is anxious to see things booming. What does it matter if he pays extraordinary wages and creates labor unrest; what does it matter if miners steal the rich ore and the morality of the community is debauched thereby; the main thing is to get out the ore and make big shipments. The mines will be gutted, the ore will enrich 'undesirable citizens,' mining as an industry will be discredited, but the individual thrives. It is individualism in a destructive form, and to that extent it typifies the tendencies of modern life, where the civic spirit is dead and predatory selfishness is rampant.

It is the same story in San Francisco. The metal workers have struck because they have failed to force the ironworks to pay them wages and to allow them hours that are impossible if the employers are to make any profit in their business. The latter have offered to grant

even the terms demanded whenever 50 per cent of the other ironworks in the East make similar concessions, it being claimed—justly, we think—that to grant higher wages and shorter hours than their competitors in other cities, would simply make it impossible to operate at a profit. The men have struck, work has ceased, and the reconstruction of the ruined City is held in abeyance. There is no thought of the welfare of the community, there is no sympathy for the men who are doing their best to rehabilitate the City, there is nothing but unenlightened selfishness, born in greed and fostered by ignorance. Of the carmen's strike and the incipient anarchy arising from it, we shall speak later on. We are inclined to question, as Truthful James did on a certain historic occasion,

"Is our civilization a failure?
Or is the Caucasian played out?"

The Mining Graduate.

THIS is the season when young men are graduated from the schools of mines and start on their career. They have had lectures enough to last for several years, and they have been loaded with advice more than they can comfortably assimilate, therefore we shall not burden them further with similar injunctions. On the contrary we address ourselves to those who are a bit ahead of these new graduates, that is, to the older men of the profession to whom may come the opportunity to do a kindness or to give a helping hand. Most of us were inexperienced once, we started with the freshness of the graduate who has a world to conquer and if we look back a few years we remember that our verdancy was more vivid and our inexperience more helpless than even the youngest of the fellows that may come to us today for a suggestion, a bit of advice, or a job! The graduates have had their baccalaureate sermons, why not give one to the post-graduates, to the old campaigners in the field? We venture to give one, counting on a favorable hearing because of the professional spirit that is almost the only fine thing left in a day of low ideals and corrupt politics. To these post-graduates in the school of experience in which the learning is never finished until life itself brings the lesson to an end, to them we proffer the request to encourage the young fellows. Even if you cannot give them employment, give them encouragement of the kind that would have heartened you when you were starting out. There are plenty of men to tell them how difficult it is to get on, and how rough is the path that leads to an uncertain sort of success; don't bother to reiterate this sort of thing, but give them a cheery word and a warm hand-clasp, tell them of some of the blunders that you made and the obstacles that you overcame. Let them know that although the work is not always in accord with the purpose of their education, and not necessarily in direct fulfilment of their ideals, it is worth doing, if for nothing else then as a preparation for an opportunity that may come. It is true we have heard of mine managers and smelter superintendents, themselves college graduates, who have announced that they wanted no university fledglings, but preferred those recruited more directly from the laboring class. For men that are such renegades to their own training, and so ungrateful to the ladder by which they have ascended, we have a cheerful contempt, for if a technical education does not make a young man more intelligent and useful, we have all made a basic blunder, and had better become hod-carriers. Fortunately such narrow-minded persons are scarce, and are rarely in authority for long, so we shall hope that our friends that graduate this year will escape an encounter with them. Most of the older professional men have learnt enough from their own blunders and successes to be aware how much they owe to a little help at the start, when each man depends upon the kindly consideration of others far more than upon any merit of his own. And whether you become the first man in your profession, or accumulate a million, you can at least win one thing worth having, and that is the gratitude of some young fellow whom you have assisted at the beginning of his career. You may have to assist several to get the gratitude of one, or you may be lucky and be remembered in the goodwill of each one that you aid; possibly, you may not be informed of the kindly feeling felt for you by any of them; in whatever way this intensely personal equation may work out, it is something to be balanced against eminence or wealth if one or two useful men can say ten or twenty years hence that they owe their first start to you, to your courtesy, to your encouragement, or to the work that you gave them the chance to perform. Some one helped you at the commencement of your career; pass it on.

IT WAS STATED in Associated Press despatches that the Supreme Court of the United States had granted an injunction to the State of Georgia against the Tennessee Copper Company and the Ducktown Sulphur & Copper Company restraining them from operating their smelters on the ground that they are a public and a private nuisance and a menace to public health. The fact, as we are informed by telegraph, is that the Supreme Court upheld the right of the State to demand protection for its forests. The Court, however, declined to issue any injunction at the present time, agreeing to give the Tennessee Copper Company reasonable time to complete the building now in progress and to demonstrate to the State of Georgia that the conditions in regard to fume can be so improved as not to cause any appreciable damage. On the failure to do this, the Court announces its willingness to issue an injunction, but not before October next. Before that time the sulphuric acid plant will be running and it is expected that the company will be enabled to make an entirely satisfactory arrangement with the State. This news is important, as it has a bearing on the agitation started against the San Bruno copper smelter, at South San Francisco. We regret the prejudice, based largely on ignorance of the real facts, that has prompted the opposition to this important industrial enterprise. We shall refer to the matter again; for the present it remains but to suggest that the protestants get unprejudiced technical advice and meet the officials of the smelter in a fair way.

Personal.

F. W. BAKER is in New York.

D. CHISHOLM, of Colorado Springs, is at New York.

F. L. RANSOME is ill with pneumonia at Washington.

J. M. CALLOW has returned to Salt Lake City from Denver.

NEWTON BOOTH KNOX was married at Yokohama on May 10.

FRED. FULLER, of New York City, is at Cananea, Mexico.

CHARLES BUTTERS sails from New York by the *Cedric* on May 17.

A. E. REYNOLDS has been on a visit to San Francisco, from Denver.

PHILIP ARGALL is going to London, sailing from New York on May 30.

REES C. VIDLER has returned to Georgetown, Colo., from London.

HERMAN WENDLER left Ures, in Mexico, on May 15, for a business trip in Europe.

W. G. MOSHER has returned from La Union, in Salvador, to his home at Kansas City.

THOS. D. MURPHY has been sampling mines in the Ameca district of Jalisco, Mexico.

ALFRED W. HARRISON, of Silverton, is the guest of his sister, Mrs. E. G. Stoiber, at Paris.

NORMAN DANVERS POWER arrived on the *Mongolia*, on his way from Australia to England.

FRANK H. PROBERT will be married at Washington on May 25, and will then proceed to Europe.

M. F. BARCLAY, who has been at Tonopah recently, on his way from London, is in San Francisco.

G. McM. ROSS and J. ALLEN REID have just returned to Stockton, Cal., from a geological trip through Nevada.

FRANK H. PROBERT will be married at Washington on May 25, and then he and his wife sail for Europe from New York.

T. H. OXNAM, general manager for the Consolidated Arizona Smelting Co. has gone to New York on important business.

ALEXANDER N. WINCHELL has been elected to fill the chair of petrography and mineralogy in the University of Wisconsin.

A. G. GORDON WILSON is in Colorado from Salt Lake City on business connected with the Kelly Filter Press Co., of which he is the vice-president.

C. G. PATTERSON, erecting engineer for Chas. Butters & Co., passed through San Francisco this week on his way to Mexico to superintend installation of the Butters filter.

M. E. MACDONALD has resigned as general manager of the Guanajuato Consolidated M. & M. Co.'s properties at Guanajuato, Mexico, and becomes consulting engineer for the same company, making his headquarters at its New York office in the Mills Bdg., 35 Wall St., but retaining an office for his private business at 40 Wall Street.

Obituary.

JOHN M. BELL, a former mining engineer and placer miner of Butte, Montana, died at Chalchihuites, in the State of Zacatecas, Mexico, on April 23, from blood-poisoning. He was connected with the mining department of the Chalchihuites Mining & Smelting Co., and while on a visit to one of the mines, his horse fell, causing a small wound on the knee, followed by blood-poisoning, which caused his death after seven weeks' illness. Mr. Bell was born at Teesdale, England, and came to the United States when about one year old. He served in the Civil War, and went to Montana soon afterward to conduct placer mining operations. He was elected to the House of Representatives in Deer Lodge county in 1880, and served for two years.

Latest Market Reports.

LOCAL METAL PRICES—May 16.

Antimony	26.25@29.25c	Quicksilver (flask)	$38@39.50
Copper	26.25@27.25c	Spelter	7.75@ 8.50c
Pig Lead	6.10@ 7.05c	Tin	43.25@44.75c

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
May 10	22⅜	6	6⅝	64⅞
" 11	22⅜	6	6⅝	65⅛
" 12	Sunday.	No market.		
" 13	22⅛	6	6⅝	65¾
" 14	22⅛	6	6⅝	65¼
" 15	22⅛	6	6⅝	65⅝
" 16	22⅛	6	6⅝	65⅝

ANGLO-AMERICAN SHARES.
Cabled from London.

	May 9. £ s. d.	May 16. £ s. d.
Camp Bird	1 4 0	1 2 9 ex div.
El Oro	1 8 9	1 6 9
Esperanza	1 16 9	1 15 0
Dolores	1 7 0	1 11 3
Oroville Dredging	0 17 0	0 17 0
Stratton's Independence	0 3 6	0 3 6
Tomboy	1 18 9	1 18 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, May 16.

Atlanta	$ 61	Laguna	1.40*
Belmont	4.05	Little Tonopah	2.50*
Columbia Mtn.	51	Manhattan Con.	60
Combination Fraction	3.00	Midway	1.42½
Daisy	1.25	Mizpah Extension	28
Diamondfield Triangle	22	Mohawk	15.00*
Fairview Eagle	57	Montana Tonopah	3.35
Florence	4.20	Nevada Hills	4.10
Gold Bar (Bullfrog)	64	Red Top	3.75*
Gold Bar (Goldfield)	90*	Sandstorm	45
Goldfield Con.	5.58	Silver Pick	69
Goldfield of Nevada	1.40*	St. Ives	99
Gold Kewanas	84	Tonopah Extension	2.75*
Great Bend	71	Tonopah of Nevada	17.00*
Jim Butler	99	Tramp Con.	57
Jumbo	4.00*	West End	1.00
Jumbo Extension	1.35		

* Bid.

(By courtesy of W. C. Ralston, 368 Bush St.)

COMSTOCK SHARES—SAN FRANCISCO.

	Closing Prices. May 15.		Closing Prices. May 15.
Alpha	06	Kentuck	12
Andes	18	Julia	10
Belcher	33	Mexican	59
Best & Belcher	90	North Gould & Curry	37
Bullion	10	Occidental	45
Caledonia	24	Ophir	2.10
Challenge Con.	18	Overman	17
Chollar	10	Savage	60
Confidence	1.00	Scorpion	10
Con. Virginia	75	Sierra Nevada	36
Crown Point	20	Silver Hill	55
Exchequer	35	Standard Con.	2.60
Gould & Curry		Union Con.	44
Hale & Norcross	46	Yellow Jacket	85

COPPER SHARES—BOSTON.

Name of company.	Closing prices. May 16.	Name of company.	Closing prices. May 16.
Adventure	3	Mohawk	86½
Ahmeek	91½	Mont. C. & C.	3⅛
Allouez	48	Nevada Con.	14½
Amalgamated	94⅞	North Butte	91¾
Arcadian	6¾	Old Dominion	53½
Atlantic	12	Osceola	140
Balaklala	9½	Parrot	21½
Bingham Con.	17½	Phœnix	1½
Boston Con.	29	Quincy	123½
Butte Coalition	27	Raven	1¾
Calumet & Arizona	174	Rhode Island	5¾
Calumet & Hecla	865	Santa Fe	3
Centennial	29½	Shannon	17¾
Con. Mercur	40	Superior & Pittsburg	17⅜
Copper Range	83⅛	Tamarack	118
Daly-West	16½	Trinity	22
Franklin	17	Troy-Man	1¾
Granby	130	United Copper com.	61
Greene-Cananea, ctf	15⅛	Utah Copper	62½
Isle Royal	18¼	Victoria	8½
Mass	6½	Winona	8
Michigan	14	Wolverine	162

(By courtesy of E. F. Hutton & Co., 490 California St.)

Mining Summary.

ARIZONA.

COCHISE COUNTY.

The Copper Queen smelter handled more ore during April than in any other month in the history of the plant. Reports state that 106,000 tons of ore were treated, the production being about 9,500,000 lb. of copper. All the furnaces were in operation during the month.——At the Calumet & Arizona smelter, the production was about equal to that for March, the output being 4,000,000 lb., which includes ore from the Superior & Pittsburg and the Calumet & Arizona mines.

Bids will soon be asked for to drive the drift from the Higgins shaft to the body of ore that was recently encountered in the Wolverine by the diamond-drill, about 450 ft. from the shaft. An old drift runs from the Higgins claim toward the Warren claim of the Wolverine, and contracts for the extension of this drift will be let in sections of 500 ft. each.——In the Paradise district of the Chiricahua Mtn., mining activity continues. At the Savage the long tramway to the smelter is nearly complete. Shaft No. 1 is down 145 ft. and stoping is being carried on, the ore averaging about 5% copper. Shaft No. 2 is on another vein, running parallel with the first.—— Morrow & Chamberlain are shipping to the smelter from their property near Paradise.

Map of Arizona.

PINAL COUNTY.

In the Kelvin district, the Big Lead M. & S. Co. is running its 50-ton concentrator, making a good grade of copper concentrate.——The Kelvin Reduction Co.'s mill, with a capacity of 60 tons per day, has started and is treating ore produced by the Big Lead Co.——The Calumet is making regular shipments.——The Arizona Hercules Copper M. Co. is increasing its force of men.

CALIFORNIA.

BUTTE COUNTY.

The executive committee of the Mine Owners' Association has decided to secure the services of the Pennsylvania dredge, to throw up a barrier of tailing at Gold Run, a point on the river below Oroville. The inner side of the stone barrier will be covered with a layer of earth, and then the water will be held until all the sand settles. The committee will visit each dredge and arrange with the operators to throw up a portion of the barrier on the ground being worked, so that there will be one long, continuous restraining wall all along the river, in accordance with the agreement recently made with the committee of the Anti-Debris Association.

ELDORADO COUNTY.

All the mines at Angels Camp are closed on account of the strike of the miners.—— Henry Koppikus has bonded the Clipper mine in the Georgetown district to New York parties.—— The work of re-timbering the lower tunnel at the Standard mine is progressing rapidly. The mill will soon start.—— At Georgia Slide, the Beattie, Pacific, and Blue Rock are working with full crews.—— A cross-cut is being run to the vein, below the old workings, in the Neptune mine, adjoining the Trench mine on the south.—— Some rich strikes are reported in the Volcanoville district.

NEVADA COUNTY.

The machinery at the South Home mine has been overhauled, the compressors repaired, and a new 1,200-ft. cable put on the hoisting-drum, and everything is in readiness to begin work. This work has been done by the Champion Mining Co., which now owns the property.

The Grass Valley miners' union has sent a request to the Mine Operators' Association, asking for an increase of 50c. per day for underground men. The operators have not considered the question yet, and no hint has been given as to what their action will be. The miners claim that many of the best men are leaving the district, to go where wages are higher.——Lessees have begun work on the Chicago mine, a few miles southeast of Nevada City. This mine has yielded some rich pockets, and Jauch & Co. will run the tunnel ahead, at the same time stoping on the lode already opened.——A crew of men is driving both ways on the vein, at the 160-ft. point in the Niagara shaft, at Kentucky Ridge. The Cornish pump is handling the water satisfactorily, and a new hoist will soon be installed.——Colorado parties have been inspecting the old Hudson mine, a couple of miles west of the Niagara.——A tunnel is in 100 ft. on the vein of the Reynolds mine, below the Newton Ridge.——There is quite a boom in quartz mining in the French Corral district, which has always been a hydraulic camp.——Some good copper indications have been found in the tunnel on the A. Y. Brown ranch.——Sinking has been resumed at the Iron Mountain property.——A rich strike is reported, in the Inkmarque mine, near the North Star. The mine is owned by Louis Rosenthal, and Abe Brockington is in charge.

SHASTA COUNTY.

The Mammoth Copper Co.'s smelter will close for two weeks during the middle of the month, in order that extensive repairs may be made. All work outside the smelter will be continued as usual.——The Mt. Shasta Mines Co.'s property was sold under a trust deed, to the bondholders, for $50,000. Four years ago the company was heavily in debt and issued bonds, secured by trust deed given by D. P. Phelps and McKenzie Cleland. The company defaulted on the interest on the bonds and the property was sold, the transfer involving the Mt. Shasta, Lucky Boy, and Monitor claims.——The raise at the Gold Leaf mine near Shasta has holed through to the surface a distance of 130 feet.

TUOLUMNE COUNTY.

A number of local capitalists and mining men have recently purchased a valuable gold mine situated in the rich mining district, near Columbia. A corporation has been formed to take over the mine, and work on an extensive scale will be begun at once. Thomas C. Heide, who owns an interest in the mine, will be superintendent of operations at the mine. No difficulty has been experienced in procuring the money necessary to take up an option to purchase the property. This result has been the more readily effected by reason of the fact that the mine is largely developed, and machinery is in place on the ground. An abundance of ore assaying as high as $100 per ton is in sight, and an abundance of power at hand renders the cost of operation small. The principal claim owned by the company is the Mountain Boy, and the corporation has adopted the name of this claim, being called the Mountain Boy Mining Co. The company also owns two adjoining

claims. The principal place of business of the corporation is at Berkeley.

COLORADO.

CLEAR CREEK COUNTY.

Engineers have been examining the old Dunkirk property, with a view to purchase. Several carloads of ore from the dump were shipped to the Newton mill at Idaho Springs for a mill-run test, and it is believed that the dump can be milled at a profit. The Dunkirk is an extension of the Dives-Pelican lode.——The Central Colorado company has been reorganized, and the tunnel will be driven farther into Leavenworth Mtn.——Air-drills have been installed at the Mammoth property, in Brown gulch, which is being operated under lease and bond by J. M. Shaller and D. J. Williams.——The Smuggler mine is showing up well with development, and concentrating ore is shipped to the Terrible mill, which makes a lead and zinc concentrate.——Lessees on the Phillips lode are shipping concentrating ore to Idaho Springs.—— C. H. Dyer has leased the Stevens mine and mill, belonging to the Waldorf M. & M. Co., in the West Argentine district. There is much ore on the dump which can be milled at a good profit if some way can be found of running the mill without polluting the water supply of the town.

HINSDALE COUNTY.

Reports from Denver state that Bardwell, Mendenhall & Co. have sold the Highland Chief group on Sheep Mtn. This is considered one of the best lead prospects on upper Henson creek.

SUMMIT COUNTY.

(Special Correspondence).—The Ten Mile district is active and the Kokomo and Frisco districts will be heard from this year.

P. P. Edward, who is operating the Kitty Innes mine, has made a new strike in the lowest workings. A cross-cut tunnel was driven into the hill about 150 ft. deeper than where the previous strike was made, which produced good ore. The tunnel is now in to the vein and some good-grade silver-lead ore is being taken out.——The Mary Verna property adjoins the Kitty Innes on the north and has been developed by a cross-cut tunnel. Operations are to be resumed by the company under the superintendency of H. T. McAlister.——The King Solomon property lies north of the Mary Verna and the main tunnel is in 1,350 ft., having cut several veins. The management is preparing foundations for heavier machinery, the present compressor-plant having proved inadequate for the work.——It is reported that the North American property will resume operations in its main tunnel. This tunnel is 1,720 ft. long and cuts the veins at great depth.——The Excelsior property is being worked under contract. Ed. Flaherty is in charge and is running drifts east and west from the main shaft. Other drifts are being run from the 100-ft. level to open a four-foot vein of good-grade ore, ready for stoping. ——Andrew Westlund, who owns the Gold King property on Chief Mtn., has run a tunnel in 100 ft. on the vein, which carries a six-inch streak of auriferous iron ore with a smaller streak of lead ore. This property looks well for a prospect.——The operations in the main tunnel of the Square Deal company have been carried on without a stop all winter. The breast of the main tunnel is now 460 ft. from the portal and is in a mica-schist formation. Several veins have been intersected by the tunnel in its course but the objective point is yet ahead. Ed. Huter is superintendent.——The Victoria, an old-time producer on Royal Mtn., is to be started up again. A new company has been formed to operate the property, with A. E. Clarke as president.——In Heckman's property, adjoining the Victoria on Royal Mtn., a vein has been struck in the main tunnel 465 ft. from the portal.

The Colorado Dredging Co. is about to construct two new dredge boats, for work on the Blue and Swan rivers. They are of the Bucyrus type and will cost $105,000 each. Mr. Tuttle is superintendent for the company and states that they hope to have them finished in time for a short run before the season closes.——The Reliance Dredging Co.'s dredge boat will start up in a few days. This company has now assumed possession of the old Gold Pan plant as well as the shops and light and power-plant of the Colorado Con. Electric Co.——The Summit Banner Placer Co. will resume operations as soon as the snow has melted sufficiently to give the necessary water supply. This property paid dividends last year under the management of C. L. Kingsbury.

The Buffalo Placer Co.'s property at Dillon will be exploited this year under the supervision of L. Kingsbury.

Breckenridge, May 4.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—The work done on the Buster mine since it was taken under bond by Fred. W. Bradley and associates, of San Francisco, surpasses anything of the kind ever done in the central Idaho district, when the number of men working in the mine is considered. Since last September a depth of 300 ft. has been reached; a 100-ft. raise has been run; a 20-ft. sump has been formed at the lower level, and 100-ft. drifts run in both directions. A station has been formed 300 ft. from the mouth of the lower tunnel, large enough to accommodate the hoisting-engine, and the drift in the lower tunnel has been pushed 100 ft. farther. Much surface and placer work has also been done. The force has recently been increased to 27 men, and by the time the bond expires on July 1, it is confidently expected that the showing will be good.

Lewiston, May 10.

NEZ PERCE COUNTY.

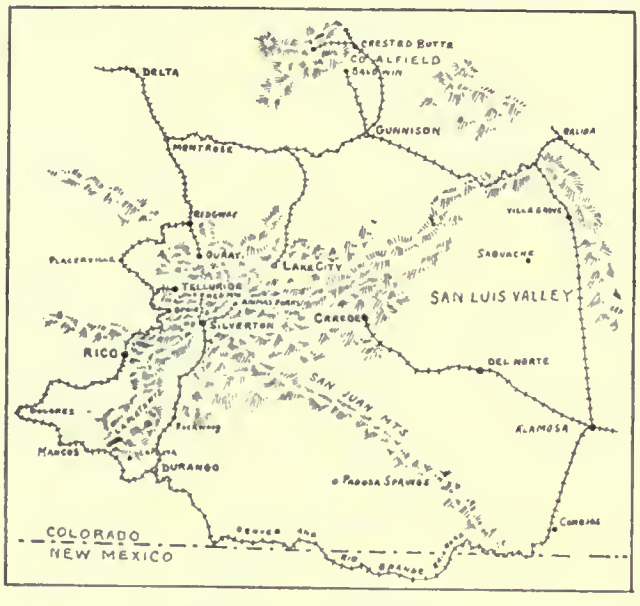
(Special Correspondence).—After several years of work, developing the Copper King mines on the Jacques spur of the Northern Pacific railroad, near the town of Winchester, John King, the owner of the properties, stated that he has made a good strike, some of the ore assaying $47 per ton.

Lewiston, May 10.

SHOSHONE COUNTY.

(Special Correspondence).—A deal was closed in Wallace, recently, when A. W. Woodworth, B. M. Francis, and G. J. Doherty of Missoula, purchased from Mrs. John Thomas a group of four mining claims near the Black Cloud mine on Nine Mile creek. The property is known as the North Star group. A 35-ft. drift on the vein encountered galena ore which averaged more than four ounces of silver per ton, and 44% lead. A company with a capital stock of $1,250,000 will be incorporated to develop the mine. Surveyors are now at work on a tunnel-site from which a 500-ft. cross-cut will be run.——Mining men from the Coeur d'Alene report that the strike recently made in the shaft of the Monitor mine is of great importance. They say the ore and vein-matter encountered at a depth of 389 ft. in the shaft continues at 410 ft. As first encountered, it had a width of 18 to 20 in., to which the management did not attach much importance further than recognizing it as a well-defined stringer lying parallel to the vein. This stringer has widened as depth is attained and others are coming in, all of which carry ore. The shaft is now at a depth of 410 ft. and is from 30 to 40 ft. into the foot-wall. The width of the mineralization at this depth is shown by the vein-matter and the ore which occurs so far from the main fissure.——Papers have been signed, giving to Frank Graves of Spokane a short-time option on 430,000 shares of the capital stock of the Bell Mining Co. at $1 per share. This gives Mr. Graves an option on control of the company, for the capitalization is only 500,000 shares of a par value of $1 per share. Finch and Campbell of Spokane and E. H. Moffitt of Wallace and their associates owned most of the stock on which the option was given. The Bell mine is considered one of the most promising of the non-producing properties in the Coeur d'Alene. It is west of the Morning mine, and south of the Frisco. The group comprises seven patented claims and two fractions, on which from $30,000 to $40,000 has been spent in development work. At one time much ore was shipped from the property, more than $100,000 worth of rich silver-lead ore having been taken practically from the surface.——Greenough Brothers who have an option on the Snowshoe mine, which adjoins the

Snowstorm on the east, are taking up the stock. The Snowshoe mine is capitalized for 1,000,000 shares and the option covers approximately 75% of this amount. The option was acquired some time ago, the majority of the stock being bonded for 17½c. per share. The No. 3 workings in the Snowstorm are being driven toward the Snowshoe, and it is evident that the orebody extends into the Snowshoe ground. When this reaches the Snowshoe it will give a depth of approximately 1,500 ft. John Mocine, acting manager of the Greenough properties in the Coeur d'Alene, says the orebody in the drift, that is being extended toward the Snowshoe, is showing up in such excellent shape that it was decided to take up the stock although the option is not due.——Electric drills will be used in the development of the West Hecla group at Burke. The machinery has been ordered. The power will be furnished by the Washington Water Power Co., a line being run from the station at the Hecla mine. This property was recently taken over by a Spokane corporation. A crew is being worked under the direction of McCallum, formerly superintendent of the Standard.——Carbonate ore has been encountered in the drift on the vein on the North Bunker Hill & Sullivan property adjoining that of the Bunker Hill & Sullivan mine on the north. The ore was encountered at a distance of 50 ft.



Map of Southwestern Colorado.

from the mouth of the tunnel. The drift will be continued a distance of about 400 ft. to get under a shaft on the surface in which some good ore was encountered, and the ore will be tapped at a depth of about 250 ft. The company owns five claims and a fraction.——Three adverse suits are about to be filed in the land office at Coeur d'Alene, at the instance of D. H. Brien, president of the Snowy Peak Mining Co., to prevent the granting of the patent applied for by the Tamarack & Chesapeake. The Monroe claim adjoins the Tamarack and it is claimed by the Snowy Peak company that the whole claim is over-lapped by the Silent Friend.——Work is progressing at the properties of the Hector Mining Co. at Wallace, and it is expected that the contract for 100 ft. of tunnel, which was recently let to Arthur F. George and Joseph Jellick of Wallace, will be completed within about 40 days. The tunnel has already been carried 100 ft. It is intended to carry this tunnel a total distance of 800 ft., when the ore that has been opened in two shallow tunnels higher up the mountain will be tapped at depth. Contracts are being let in sections of 100 ft. each.——Concentrates from the Black Cloud and California mines in the Nine Mile district of the Coeur d'Alene, near Wallace, owned and operated by the Pittsburg Lead Co., are reported to be the richest coming from the mills of the Coeur d'Alene at present. They are assaying 78% lead and 72 oz. silver. The Black Cloud and California mines are among the old producers of the district. A year ago the Pittsburg company obtained absolute control of them, but prior to that time the company had been operating them for a year. Since it first began work in the neighborhood of $200,000 has been expended in developing the mine and improving the mill. Fifty men are employed at the mine and mill, and the number will soon be increased.——The Hecla Mining Co., which owns the Hecla mine at Burke, has declared a dividend of 10c. per share, or $100,000. This brings the total for this year to $140,000, and makes the mine's total dividends to date $1,140,000. The regular monthly dividend is $20,000, or two cents per share, but extra dividends are paid every quarter. The Hecla company is incorporated for $250,000, divided into 1,000,000 shares of a par value of 25c. per share.——Directors of the Champion Copper Mining Co. decided to resume operations near Wallace, with three shifts of men. The four claims, which are in the Mullan copper belt, adjoin the Parl Copper and Springfield mines. The principal owners are: Adam O'Donnel, president, and John H. Wourms, treasurer.

Spokane, May 11.

INDIANA.

MORGAN COUNTY.

(Special Correspondence).—Much interest and activity is being shown this spring in the placer mining districts of Morgan county of this State.——The Magg & Roch machine, built by J. M. Neishart, of Pasadena, will commence operations within a week on Lamb's creek.—— Mr. Craver, of Chicago, is in the field, and expects to put his 500-yd. machine in operation soon. It is on Sycamore creek, at the junction of Gold creek.—— The Magnetic Mining Co. has its outfit nearly completed, and will be in operation on Sycamore creek, above Cottonwood Hollow, in a few weeks. —— The Gold Creek Mining Co., and Indiana Placer Mining Co., will commence work as soon as they can secure the services of a competent superintendent.—— There are many leases being secured in the territory, about eight thousand acres being under lease up to the present time, and gold placering will be done on an extensive scale.

Indianapolis, May 10.

MICHIGAN.

KEWEENAW COUNTY.

Navigation is now open at the copper country ports, and copper will be shipped by boat. None of the smelters have any surplus metal on hand, as every pound produced has been shipped by rail, with as little delay as possible. The arrival of the boats will preclude any possibility of a coal famine.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—Things are very lively here, and many of the mines are looking well.—— At the Bonnie Clare, development is progressing, some excellent ore has recently been extracted, and the sinking of the shaft steadily continues.—— A vein 18 in. wide has been discovered in the Gold Mtn. Eagle mine. The find was made in a shaft that was abandoned several years ago. A spur is being built to the mine from Montana station on the Tonopah & Bullfrog railroad, six miles distant.—— Some free-milling ore has been struck in the Nevada-Goldfield mine, at Gold Mtn.—— At the Wyman-Vick property, near Old Camp, the shaft is being sunk. George E. Wyman will superintend operations.—— Some ore has been encountered in the Centennial mine. Several men are employed, and indications are excellent.—— Local mining men are anxiously awaiting the coming of the Bishop Creek power-line, which will pass through this district. The coming of cheap power means that many of the mines now lying idle will be in operation.

Lida, May 12.

LYON COUNTY.

(Special Correspondence).—Copper has been struck in the Ramsey Comstock mine, in the shaft, within 20 ft. of the third level. The first time copper was encountered was in the second level. This time it is in the dike and the ore is not as rich as in the shoot along the seven-foot stringer in the centre of the dike. The incline shaft has been sunk on

a uniform pitch, and at the second level the wall bends to the west, as the vein flattens out and the shaft was continued in porphyry. Twenty feet before the third level was reached, the lode re-entered the shaft and shows copper, diminished, however, in value. In the shoot on the second level, the winze in the north drift has been sunk on the hanging wall, and the high-grade streak has bent west to the wall, where it is two feet wide and has changed to a hard sugary quartz. This ore is better in quality than when first encountered in the mouth of the drift and it is being sacked for shipment. When the third level is finished, the cross-cut extended across the dike, and the drifts opened up on either side in the high-grade shoot, the company will cease development except to continue the shaft to the 500-ft. level, and will begin work on a mill.

Ramsey, May 7.

NYE COUNTY.

(Special Correspondence).— Development at the West Extension is progressing, and a carload of ore from the west drift will be shipped to the smelter. The ore contains gold, silver, and copper. The suit of the West Extension Co. against the Apex M. & M. Co. has been decided in favor of the former company. The suit involved the title of the West Extension and Bullfrog Fraction properties.— The controversy between the Bullfrog of Nevada and the Diamond Bullfrog companies has been adjusted by the consolidation of the properties. An attempt was made to include the National Bank mine in the deal, but the latter company refused to join the merger.—— A 15-h.p. gasoline hoist has been installed in the winze on the fourth level of the Denver mine. The station is 20 by 50 ft., and at a vertical depth of 350 ft. The company will sink the shaft, cutting stations every 100 ft., and running drifts and crosscuts.—— The new hoisting plant on the Bullfrog Teddy is in operation, and the shaft is down 75 ft. Good ore has been encountered, and the management expects to strike the West Extension shoot. Both properties are controlled by the same company.—— Fred. Burnham and Leo Atcheson have disposed of their Big Sioux Warrior and Waldo claims at Lee to Boston capitalists.—— Several rich strikes are reported from the Mayflower, and the mine looks promisIng. The working force has been increased and some ore has been blocked out.—— A force of men is opening up ground at the Victor, and some good ore has been taken out.——It is reported that Walter Scott is about to dispose of his Death Valley mine to capitalists, including Louis Schloss, of San Francisco.

Rhyolite, May 10.

WHITE PINE COUNTY.

(Special Correspondence).—The Nevada Consolidated has been exploring a large area with churn-drills, and has encountered good copper ore in nearly every hole. The lack of experienced drillers is hinderlng the work of exploration.——Three shafts are being sunk on the holdings of the Ely Consolidated, and the mine systematically developed. The Brilliant shaft is down 120 ft. in sulphide ore. The American shaft is down 505 ft., and the Zack shaft has attained a depth of 350 ft. All the shafts are in good ore, and are equipped with gasoline hoists. The vein in the American contains silver, lead, and copper ore, running $30 per ton; 35 men are on the payroll.——The Steptoe Consolidated Co. is sinking a shaft on its claims. A four-foot body of ore was struck, the vein containing copper and lead.——Exploration work at the Ely Central is proving the existence of a body of fair-grade ore. In some of the holes, the vein is 125 ft. thick.——The Ely Hercules Co. has secured a bond on the Winston group and will immediately proceed to develop the property. Work will be at once started on the company's holdings at the Pass, 2½ miles from town.——Everything is in readiness for the installation of the machinery for the concentrator at the Giroux Consolidated property. Development work at the mine is rapidly progressing and large quantities of ore are ready for treatment.——A rich strike is reported from the Copper Jack claim at Mizpah, samples of the ore carrying gold, silver, and copper, and running several hundred dollars per ton. Two shafts, the Copper Jack and Jumbo, have been sunk on the claim. The Copper Jack is down 25 ft., and the Jumbo 45 ft. In the Copper Jack the lode is three feet wide.——Two shifts are sinking the shaft on the Tenderfoot claim and rapid progress is being made. Ore running $200 per ton is being extracted.——J. A. Fesley and Charles McFadden have commenced work on their El Moro property and will soon have a large force at work sinking a shaft.——Active development work has started on the Success shaft and the owners report the finding of some promising ore. Arthur Cordiner and J. Alpert control this claim.

Ely, May 10.

OREGON.

BAKER COUNTY.

Work will be rushed at the Golden Chariot, and a drift will soon be started from the shaft toward the vein.——The Crane Flat dredger will soon start work under the direction of George Telford.——The 20 stamps in W. E. King's Rainbow mine, in Mormon basin, have started dropping.—— Charles Guist has sold his half interest in the Wagner-Guist gold property in Mormon basin for $9,000.——A meeting of the shareholders of the Tourmagin Arm Mining Co., handling the California and the Oregon Development companies, was recently held in Chicago, and it is expected that more active work at the mines will result.—— The Bonanza mine and mill will be worked again under the management of Al. Geiser.—— C. M. McClaren will start work at the Adeline mine at once.—— There is a good deal of activity in the copper region east of Baker City. G. E. Alexander will superintend development of the mines belonging to W. H. Harris, in the Goose Creek district.—— Some good clean-ups are being made at the Pine Creek mines, owned and operated by the Merchants' Gold M. Co., of Baker City.

JACKSON COUNTY.

The coal mine on the Furry property, seven miles northwest of Ashland, has resumed operations. This mine is to be operated in connection with the Blue Ledge copper mine for Robert S. Towne, of New York. A new tunnel is being driven to drain the workings. It is in 100 ft. and will be driven 375 ft. farther.——Work on the coal property at Asbestos has been started. The vein is 14 ft. wide, with eight feet of good coal. The product will be hauled to Gold Hill.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The report at the annual meeting of the stockholders of the Pearl Consolidated Mining Co. shows that there is a large tonnage of ore exposed in the mines, but its average value is so low that a mill is needed on the ground to treat it. The company cannot raise enough money to build a mill and block out the ore to keep it running by assessing the stock up to the legal limit of five cents. Hence it was decided to lease the company's mines to H. L. Rodgers and give him an option to purchase them for $156,000, the royalty to apply on the purchase. The lease calls for a royalty of 10% of the gross assay value or all $8 ore or less that is milled, and an additional 50% on all ores having a value in excess of $8 per ton. The lessee must pay all taxes during the life of the lease, beginning with the year 1907 and pay interest on the mortgage against the company, and must begin work on the mine on or before August 27. The agreement on which the option to purchase was based, requires a mill to be completed not later than June 27, and the lease extends three years from that date. The ore shipped from the mine from March 1 to June 2, 1906, aggregated 1,641 tons, of a gross value of $10.33 per ton and netted over freight and treatment at smelter, $4.22 per ton. Ore shipped during the same period from the dump amounted to 241 tons, which netted $1.41 per ton.——F. R. McMillan has succeeded J. L. Harper in the management of the Belcher Mtn. railway, which is being altered and put in repair for continuous operation.——Work is being pushed on the adit at the Winnipeg mine, in the Belcher district. A sample of ore three feet wide, crossed by the adit, had a value of $97.70 per ton.——The Staight Mines Co. is following a streak of iron-sulphide ore from the lower adit on the

Anonymous group, which assays $8 per ton in gold. It was struck 375 ft. from the portal.——On the Columbia river, near Northside, in the northeastern part of Ferry county, machinery to sink 1,000 ft., consisting of a Sullivan air-compressor and duplex hoist, has been installed at the Sunset mine, which is showing up well.——On Iron creek, 40 miles southeast of Republic, on the south half of the Colville Indian reservation, an adit is in over 300 ft., and a three-foot vein has been encountered which carries copper, nickel, and silver.

Republic, May 10.

OKANOGAN COUNTY.

(Special Correspondence).—In the Meyers creek district, the Molson Gold Mining Co. has contracted for machinery for the Poland-China mine, consisting of a rock crusher, nine 1,200-lb. rapid-crushing quadruple-discharge stamp-mills, with automatic feeders; a No. 3 Merrall's improved roll-mill (Chilean principle), and large amalgamating plates; a 50-h.p. steam-engine and boiler, etc., to be supplied by the Merrall's Machinery Co., and to cost, installed, about $18,000. The company has a large tonnage of ore exposed in the mine, which is estimated to average about $20 per ton. The officers of this company are: D. W. Dart, president, and H. F. Beckery, general manager, both of Dayton, Ohio. M. A. Smalley, of Chesaw, Wash., is treasurer.

Republic, May 12.

MEXICO.

SINALOA.

Consul Louis Kaiser, replying to an inquiry from the United States in regard to the development and natural resources of the Mexican State of Sinaloa, writes from Mazatlan in part as follows: The State of Sinaloa is rich in mines and agriculture, and has millions of acres of

Part of Nevada.

splendid land for farming and stock raising, and is well suited for the culture of fibres of different kinds. These lands are nearly all undeveloped and bring from $1 to $10 per acre, according to quality and location. Investments of any kind should be made with the utmost caution, and only after a careful personal inspection.

The Southern Pacific Railroad Co. has secured from the Mexican Government a subvention of $750,000 gold, and the company has deposited $120,000 gold for the fulfillment of their part of the contract to build the Cananea, Yaqui River & Pacific railroad, which, when completed, will be 1,000 miles in length. Two sections of the road 200 miles in length are finished and are open for traffic from Empama, Sonora, south to Corral. From Corral the road will run to Valdervain and Buena Vista, and thence to Culiacan, the capital of Sinaloa. The third section extends from Mazatlan to Tepic, and the fourth section from Tepic to Guadalajara, the southern terminus. The rails for the road were bought in Spain, and most of the ties and sleepers in Japan. The contract for grading the entire length was awarded to a firm of Los Angeles, California.——The Kansas City, Mexico & Orient railroad is pushing its road from Topolobampo, a small port on the Gulf of California, and has about 150 miles of the line completed. The contemplated Durango & Mazatlan railroad, which will be a branch of the International line, and will be about 175 miles long, has finished its surveys, and it is now believed this extension will be built.——The climate on the west coast of Mexico for eight or nine months of the year is all one could desire. The rainy and hot season begins in July and ends the latter part of September.

SONORA.

At the Greene Consolidated property, development work includes two new shafts, shaft No. 12 and the new Prieta shaft. Shaft No. 12 is being sunk to the fifth level of the Veta Grande on the Oversight orebody, while the Prieta is down about 50 ft., near the north line of the Cananea-Bisbee.——Some ore is being taken out of the American mine, during development. New discoveries on the third level at the 170-ft. point, have demonstrated the presence of good ore. New ore-bins, with a capacity of 500 tons, will be built below the shaft-collar.——Some strikes of ore are reported in the Mina Mexicana of the Greene-Cananea company on the mesa about 10 miles south of Cananea.

NICARAGUA.

Consul E. W. Trimmer, of Cape Gracias á Dios, furnishes the following information in regard to the mining industry of Nicaragua: The mining industry in this district continues to show a steady improvement. Plants for the treatment of tailing by the cyanide process have been installed at a number of mines, and results have proved so satisfactory as to warrant a large increase in capacity. The output of gold bullion from this district now amounts to about 5,000 oz. monthly. The electric-power plant installed by one company has been in successful operation since February, 1906, and a new generator is now on the way and will be used to supply power to a group of mines. Transportation has been so much improved since the river steamer of the United States & Nicaragua Co. was put in commission that it is now possible to get machinery and supplies into the mines at a fair cost.——The ore-bearing limits of the district have not yet been ascertained, but the location within the past two years of many ore deposits at distances of 20 to 30 miles from the main properties warrants the belief in a fairly continuous ore-bearing zone along 50 miles or more of the foothill region, with a width of from 12 to 20 miles. Owing to the thick tropical growth, prospecting as it is known in the United States is impossible. Natives as guides and machete men are necessary. Several rich placer deposits have been discovered and worked out by crude methods, but in the opinion of mining men the present and future prosperity rests on the large bodies of medium-grade milling ore. The deposits thus far opened occur as replacements along fault lines and fissures, occurring largely in highly altered andesites and other eruptives. The surface soil and grass roots resting on and near the outcrop of ore-bodies have been found to contain gold at widely scattered points, and most of the mines have confined their operations to treating this surface soil in Huntington mills.

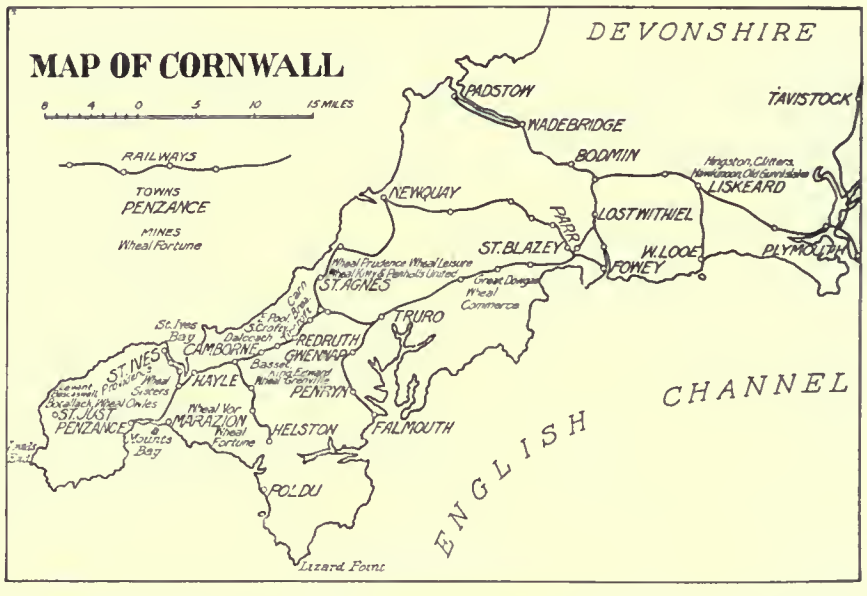
Rich shoots of oxidized ore have been found at all the mines near the surface, and below that point very little work has been done—in fact, there is not a hoist in the district. Unaltered sulphide ores occur in large quantities, carrying from $8 to $40 per ton in gold, in addition to sulphides of iron, zinc, silver, copper, and lead. The mines are at an altitude of 1,500 ft. above sea-level and distant some 250 miles by river, or 100 miles in an air-line, from the coast. For many reasons this is not considered a desirable country for a penniless miner, labor being performed cheaply by natives, but for a mining man who can command a few thousand dollars the district is considered by engineers on the ground to be a promising field. They also say that many known ore deposits exist which in the United States would be considered worth immediate development, the present operators selecting only those which are the most easily reached and favorably situated.

Special Correspondence.

London.

Banket in England.—The Chastan Syndicate.—Optimistic Speeches.—Labor in Cornwall.—Dolcoath Shaft.—Electrical and Cornish Pumps.

Lovers of beautiful scenery have had to put up with the operations of the Kent Coal Co., which, by the way, has not yet had the chance to mingle any of its product with the constituents of a London fog. What will now be said to the opening of a series of mines along a gold-bearing 'main reef' (with the roar of its stamp-batteries) alleged to have been discovered in the charming belt of country, lying between the rivers Severn and Wye, commonly known as the Forest of Dean? The directors of the Chastan Syndicate, which rejoices in an Admiral as chairman, have been the subjects of strong remonstrance from the press on account of the obscurity that veiled their doings while the stock was mounting to a substantial premium. Reasons for the directors' secrecy have now been made clear. At the general meeting this week the chairman told the stockholders that before the syndicate was formed the discoverer of the reef attached the utmost importance to the locality being kept a dead secret. The district presented great difficulties. It appears that every free miner in the Forest of Dean has the right to peg out a claim, but he is not obliged to develop this claim, but can let it stand over until it suits his convenience to do so. Secondly, there is great difficulty in finding out who really are the possessors of these claims, and, when you do, you find a great number of them, and they all have to be dealt with. The Company has succeeded in obtaining a freehold of 102 acres, and leases of 1,814 acres, with the entire command of the lode over 12 miles. The directors are asking for licenses to mine minerals of all sorts, and they are told there is good iron on the property. The actual net cost paid to the vendors of these properties, without commissions or legal charges, is £11,468. With regard to the explorations, an adit has been driven one-third of the necessary distance, and by the end of May the main body of ore will be reached. A report made by experts, specially chosen by some of the principal shareholders, showed low assay-values, but it substantiates three facts: In the first place, the experts say that the supply of conglomerate ore, similar to that of the Rand, is inexhaustible; in the second place, the whole length of outcrop shows gold; and in the third place, they say it can be worked at a small expense. Charles F. Kennedy, the managing director, addressing the meeting, remarked that the capital of the Syndicate was all subscribed privately, without any prospectus and without any publication whatever in the papers. It was only after spending some time on the property that he began to understand what a really stupendous proposition the Syndicate has. "You can see bold headlands sticking out as plainly as possible with conglomerate all over them. We have had it proved beyond any question of doubt that it is gold-bearing. There has not been a single sample taken from the property, to my knowledge, that does not show more than a trace of gold. The question is: Is it a payable proposition? If it is a payable proposition—even if the returns after paying expenses are very low, and it is a low-grade proposition—we have something that will be so huge in its returns, treated on a large scale, that there is not a gentleman in this room who can sum it up in figures."



In answer to a question, Mr. Kennedy said that of the manager's samples, which he took across six feet of reef, one went 3 dwt.; others went as high as 5 dwt. 5 gr. down to 16 gr. The average result of something like 17 samples was 3 dwt. 8 gr. The adverse experts say that the cost of working will be well under 8s. per ton. The Syndicate manager states that it will be about 8s. If, therefore, said Mr. Kennedy, they had a yield of 3 dwt. per ton, and 1 dwt. of it was profit, the result came to about £145,000 per annum with 600 head of stamps, and it would take many more lifetimes than those of everyone present put together to work the property out.

Turning to Cornwall, a local writer who speaks with authority states that "if Cornish miners co-operate with the capitalists in draining and proving the scores of mines that have long been idle, the time will come, the time of good profits and dividends, when the miner will command a larger wage than he will receive during the preparatory stages. And in the meantime the industry must be judged rather by the thousands who remain in it, than by the scores who after earning American or African wages and contracting the habit of spending freely, grumble at the rate of pay and again book their passages to the lands across the seas. Cornwall may not be an industrial paradise, but it has its points—as well as its pasties." The attitude of the new landlords regarding the pressing need for resuming the sinking of Williams shaft at Dolcoath continues the subject of eager discussion in the mining papers. A statement of Capt. Josiah Thomas is recalled, in which he said: "As to this new shaft, he wished that it was down instead of just being started, for it would undoubtedly effect, when completed, a vast saving in the working expenses of the mine." Further he added: "They might scarcely be prepared to hear this, but it took the men employed in the bottom of the mine from two to three hours to get down and to come to surface, so that they could not actually work much more than four or five hours per day. When the shaft was completed the men would be sent down to their work in two or three minutes." The efficiency of the Cornish pump, exemplified at Clitters United, as compared with electric pumping was referred

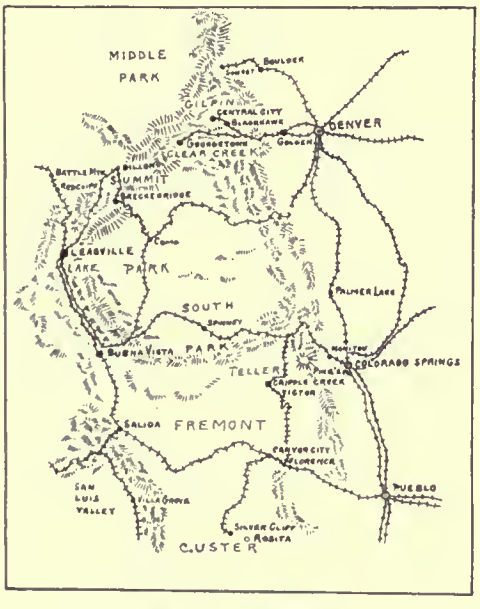
to at the meeting of stockholders recently. It appears that when they embarked upon the unwatering of the mine the plans, deposited in the Duchy, and which were supposed to be authentic, showed that it was a vertical and perfectly straight shaft, with no twists in it, and in installing the Cornish pump they allowed for this straight shaft, whereas in actual working it proved to be in the nature of a corkscrew shaft. By the time they had reached the 140-fathom level that pump had come to the end of its power, until they could stop the pump and increase the speed of it by altering the gear. The directors ultimately decided to put in an electric pump, which would take them down to the bottom of the mine, and which should hold the water while they were making the change with the Cornish pump. From the time the electric pump was completed down to the 140-fathom level it has been nothing but one constant source of anxiety. The contractors kept changing and altering the pump in points where it was defective, but there was never a long enough run to make the management feel safe enough to disconnect the Cornish pump and rely for five or six weeks at a stretch upon the electric pump.

Leadville, Colorado.

Diamond-Drilling.—Report of the Yak Tunnel Co.—Excellent Results.—Future Policy.—Sugar Loaf Mtn.—Strike in the Matchless.—Leasing on the Ibex.—An Old Smelter to Resume.

A report recently issued by W. W. Davis, manager of Yak Tunnel Co., contains much of interest to the public generally. There was completed last year about 6,500 ft. of drifts, winzes, and raises; the diamond-drilling, which was an important feature of the prospecting work, amounted to 10,069 ft. The number of drill-holes bored was 33 and of that number 12 disclosed ore. The mammoth power-plant at the portal of the adit was sold last year to the Leadville Light & Power Co., but is still affiliated with the Yak company. There was shipped through this adit, during the past year, 160,000 tons of ore and waste. "About one-half of the ore shipped from the company's properties netted less than $3 per ton, but it was necessary to remove it during the regular course of development work." The report refers to the policy of the company in the matter of extending the adit into new territory for the purpose of draining and mining. After reciting its extension to No. 4 shaft of the Little Johnny, 10,813 ft. from the portal of the adit, it is stated that the bore of the adit has been extended 750 ft. beyond shaft No. 1 to the Little Vinnie shaft. "This extension has been made with proper contracts for drainage from the Golden Eagle Mining Co., the owners of the Little Vinnie claim, with advantageous arrangements for the company with lessees, whereby said shaft will ultimately be connected with the adit." As to the immediate future, the policy of the Yak company will limit the actual development work on company account (except in the case of the Fortune group) to certain properties west of those of the Sentry company, which lie west of a point about 2,500 ft. beyond the new Little Vinnie shaft. While due encouragement will be given to the development of properties beyond the Sentry group, the Yak, as a company, will not expect to engage in the development and exploration thereof, further than to arrange for driving of the adit under a form of contract believed to be just and fair for all concerned. However, work will be continued at the various points along the line of the adit, which has been in progress for some time past. The income for the year 1906 amounted to $426,259, of which $320,000 was distributed in dividends. The total dividends paid from March 31, 1904, to December 31, 1906, amounts to $707,685. "The Yak company owns in fee simple 195 acres of mining ground" together with large acreages of surface territory "and it may be concluded," states Mr. Davis, "that without the most modern and best approved equipment for carrying on these operations economically, the successful conduct of our mining would have been impossible."

The recent strike in the Sunday mine on Breece hill has proved to be a most substantial discovery and along with the Chipawa it now takes its place in the ranks of productive veins of the first rank.——There is more activity in the vicinity of Sugar Loaf Mtn. this spring than at any time in the past decade. The Dinero company, the most important in that district, has a thoroughly modern power-plant in operation and the adit is being pushed forward at the rate of eight feet per day. ——At the new Monarch mine the manager reports the Cleveland shaft to have reached a depth of 600 ft. The bottom of the shaft is called the fourth level and a drift is being driven to cut the vein that has furnished 1,000 tons of high-grade ore per month for more than a year.



A Part of Colorado.

The recent strike of rich ore in the Matchless mine, again brings the Tabor property into prominence. It will be remembered that this property has practically laid idle for the past ten years, but a set of lessees have shipped several carloads of ore from the new strike and with no signs of giving out.——Timothy Kyle reports that after beating down the water in the Evelyn shaft in Big Evans gulch, he has found ore of an excellent grade, which the former operators reported when driven out by the heavy flow of water.

The Ibex mine, with its 150 sets of lessees and 450 miners, is shipping the usual quantity of over 400 tons daily. The ore coming from the Hanewald lease is as rich as any body of ore ever produced from the famous property.——It is reported that the Elgin smelting plant, on the north side of the city, will be blown in again during the early part of the coming summer. This plant was built not many years ago, and is in good condition at the present time. The lack of smelting facilities in the district, especially for sulphide ores, has prompted Denver parties to seriously consider putting this plant again in operation.——A. F. Wuensch has installed an electric hoist and completed all surface improvements preparatory to sinking a shaft on the Delaware property, about 1,000 ft. southwest from the Crescentia. According to calculations based on the Crescentia, the first contact should be reached at 550 feet.

Toronto, Canada.

Shipments From Cobalt.— Exploratory Work in the Nipissing.— Mining in the Bed of Lakes.—Prospecting on Islands.—Manitou Lake District.

Shipments of Cobalt ore for the week ending May 4 amounted to 138 tons from the following mines: Coniagas 31, O'Brien 65, Silver Queen 22, Townsite 20 tons. Shipments have been light, the roads being almost impassable, and, for the same cause, the delivery of machinery has been much delayed. Owing to the activity of prospectors during the winter, and the large number of claims awaiting inspection, the staff of inspectors has been increased to eight. In addition to A. H. A. Robinson, who was engaged last year, the following have been appointed: A. G. Burrows, late provincial assayer, C. W. Murray, G. C. Mackenzie, G. R. McLaren, R. T. Irwin, E. Wade, and D. W. Houston. They enter upon their duties at once.

T. R. Drummond, the newly appointed superintendent of the Nipissing mine, has 250 men at work. The force will be increased to 600 as soon as the buildings for their accommodation are completed. In all nine shafts are being put down. A cross-cut run at the 110-ft. level from one of the new shafts has encountered vein No. 26 at this depth. The shaft on that vein is only down 60 ft., and the demonstration of its continued richness at a lower depth is regarded with much satisfaction. In the course of development work on vein No. 49, three cars of ore have been removed and are ready for shipment. Driving is being carried on at 110 feet. On vein No. 27 from the open-cut on which the larger proportion of the output has been taken, the shaft is down 60 ft., and 300 ft. of driving has been done in two directions. A cross-cut is being run for exploration purposes. The building for the sampling works is completed and the plant is being installed. Some ten cars of ore are ready for shipment.—— At the Ontario-Quebec mine two veins crossing at right angles have been found to yield good silver ore at the 50-ft. level. The larger vein showed 45 oz. silver per ton at 30 ft., increasing in richness at the lower depth.—— The Right of Way Mining Co. has engaged Joseph C. Houston, formerly of the O'Brien mine, as superintendent. Substantial buildings are being erected and the plant is expected to be in operation in June. Another shaft will be sunk opposite the Silver Queen, the vein of which runs into the Right of Way.—— The Kerr Lake Crown Reserve Co. has decided to lower the lake by eight feet, which will expose a considerable area of the bed. Native silver has been found 16 ft. below the surface of the water.——The Lumsden Mining Co. has 94 men at work on the Brady location, adjoining the Beaver and Temiskaming properties. As a result of 4,020 ft. of stripping, some 14 veins have been uncovered, showing native silver, in addition to cobalt, smaltite, and nickel.

The Temagami Silver Mining Co., which owns three islands in the Cross Lake arm of Lake Temagami and the adjoining bed of the lake, an aggregate area of 120 acres, has sunk a shaft 60 ft. on island A, where several veins have been uncovered. A depth of 60 ft. has been reached on a vein of galena, the ore carrying $86 silver and 350 lb. lead per ton. A copper vein with a surface width of 3 ft. was encountered in the shaft. R. E. Patterson, formerly superintendent for the Clergue Copper Co., is in charge.

At the Paymaster gold mine, in the Manitou Lake district, a new adit advancing on the 100-ft. level, has opened up a quantity of rich ore, the quartz being speckled with visible gold. Equally good ore has been found at the 200-ft. level.—— Trouble with the laborers has occurred at the Laurentian, in the same district, a number of recently engaged foreigners having become dissatisfied and quit work. The superintendent, R. B. Nickerson, is looking for men to fill their places.

Butte, Montana.

Productive Activity.— Several New Mines. —Belmont Shaft Re-timbered.—Improvements at the Reins.—New Machinery.—Davis-Daly Estates.—Railroad Rights to Mine.

Mining conditions generally are excellent in Butte and are constantly improving. Officials of the large companies say their mines have never produced so heavily and have never yielded a better quality of ore than they are now yielding. The smelting capacity of all smelters in the State is taxed to the utmost, and if smelting facilities were available the output of the Butte mines could readily be increased from one-third to one-half. Some of the new companies, organized within the past 12 and 15 months, are doing well. Several of them are already shipping ore regularly, among these being the Amazon-Butte, Butte Central & Boston Bullwhacker, and East Butte companies. There are other companies that are rapidly reaching the producing point, and may be counted on to yield considerable ore within the next six months. These latter include the Davis-Daly, Farrel, and Alliance. There are a score of others active in development and exploration work and many of them are expected to become productive within a year. Among them are the Butte & London, Butte & Bacorn, Butte-Milwaukee, North Butte Extension, Colusa-Leonard, Butte & Superior, Calumet & Butte, Ida-Montana, and Tuolumne. The stockholders of the Butte Copper Exploration Co. have not yet given up hope, though it may become necessary to sink deeper and to reorganize the company to raise more money with which to carry on the work. Among the other new companies that are doing some rapid sinking, but which do not expect to be in the producing class for several years, are the Butte & Ballaklava, the Pilot-Butte, the British Butte, South Butte Mining, and South Butte Copper.

The Reins Copper Co. has made some improvements at its mine, putting in a new air-compressor and an additional 200-h.p. boiler. The company is mining some ore on the 900 and 1,000-ft. levels and is carrying on development work at the same time. The ore mined is not large in quantity, but is high-grade, two cars recently shipped netting the company $5,500.——The Butte Copper Co. shaft on the Trifle claim has reached a depth of 620 ft. A station has been cut at the 600, where a pump has been installed. The company expects to reach the 1,000-ft. point early in September.

The Anaconda mine was closed for six days last week while repairs were being made to the engine, and during the suspension no ore was hoisted. The Anaconda Co. has decided to increase the shaft of the Belmont mine from two to three compartments, and re-timber the whole shaft from top to bottom. It is now about 950 ft. deep, and will be converted into the main working shaft. Connections have already been made with the shaft on the 1,600-ft. level of the Anaconda mine, and cross-cuts from various levels of the Anaconda and Never Sweat down to a depth of 2,400 ft. are headed toward the Belmont, which lies nearly a mile south of the Anaconda shaft. While the work of enlarging and re-timbering the Belmont is in progress, there will, of course, be no ore mined from that property.

Some erroneous statements relative to the Davis-Daly Co. published in the East may be misleading to people not familiar with actual conditions in Butte. The com-

pany unquestionably has some of the best mineral ground in the Butte district, but none of its properties are yet producing ore, and cannot be expected to be producing because the company began development work only a few months ago. Only one of its properties, the Silver King, has produced anything in recent years, and no attempt is being made to do any mining there, as the shaft is being sunk deeper. Sinking is also going on at the Mt. Moriah, Colorado, and Smokehouse, but no ore is being opened up. The long cross-cut from the Original mine has encountered a vein, but work had to be suspended temporarily on account of the heavy flow of water, and the value of the vein has not yet been determined. Driving also is going on at the 500-ft. level of the Smokehouse, but both east and west drifts have encountered a badly broken vein, and some exploration work has been found necessary. Therefore the published statements that the Davis-Daly Co. is producing ore or has opened rich deposits are erroneous. The company has several hundred acres of ground extending through the centre of the district and adjoining a dozen of the big Amalgamated mines.

An important question is being tried in one of several suits brought in the Federal Court at Butte by the South Butte Mining Co. against various property owners and small mining companies to determine its right to the mineral under the right-of-way of the Montana Central, or Great Northern, railway, the South Butte Co. being the organization that assumed title to the mineral claimed to be owned by the Great Northern. Not only the Great Northern, but other railroads, in many instances, secured easements without reservations of mineral rights by the grantors, and should the South Butte Mining Co. be successful in its fight, it would mean the loss of a vast amount of rich mineral ground in the Butte district. Many lawyers claim that a railroad company can not acquire title to mineral under a right-of-way deed, and on that theory the company is being opposed. Testimony is being taken before a master in chancery and the litigation will probably be long drawn out.

Chihuahua, Mexico.

General Activity in the Santa Barbara District.—The Tecolotes Mill. Veintiuno de Marzo.—Parral Power Plant.—The Adela Group.—Carvoid Mining Company.—Los Bronces.—The Santiago Mines.

The Cuadras mine, recently purchased from the American Smelters Securities Co. by the Marina Mines of Mexico, a London company, has been shipping steadily to the Torreon smelter. The shaft is down 515 ft. on the lode, which is 15 ft. wide at the 400 and 500-ft. levels. The average grade of ore, as given by Mr. Dodson, the manager, is 1,500 grams silver, six grams gold, 12½% lead, 5.79% copper. The lode is the southern extension of the Zaynas, which is one of the main veins in the San Francisco del Oro group of mines.

The Tecolotes mine, owned by the Guggenheims, in the Santa Barbara district, started the second unit of the 600-ton mill on the first of April, and work on the third unit is being pushed. The 2,500-h. p. Loomis-Pettibone suction gas-plant has been running for the last few months, and is giving satisfaction. The consumption of mixed coal, as given by one of the engineers, is 0.6 to 0.7 lb. per h.p.hr., or approximately 2½ lb. wood. The power-house, which contains nine 250-h.p. American Crosby engines, is almost completed and, after a month's test-run, has been taken over by the company. The engines are connected to General Electric Co. 200-k.w. 400-volt three-phase, 60-cycle generators. The mines are connected to the mill by a one-mile narrow-gauge railway, steam being used for the present, but it is the expectation to change to electric power later on. In the mines there are 800 metres of electric tramway. At the mill and power-plant they are erecting new houses for the accommodation of employees.

The Veintiuno de Marzo is now producing ore, and, as soon as the titles are secured, this property will begin shipping. It lies in the Jimenez district, four hours out of Rosario, the terminal of the Parral branch of the Mexican Central railroad. This property was denounced

Map of Mexico.

in March by Estaban Garcia of Parral, and consists of six pertenencias. The ore is copper containing some silver and gold, the average ore running 10% copper, 200 gm. silver, and 3½ gm. gold per ton. Work was begun on March 21, and good ore was uncovered at the start. It is the intention of the owner to push the work as fast as possible, and, as soon as the titles are secured, to begin the shipment of ore, which is now being stored on the patio.——The Parral Power & Reduction Co. has its power-plant completed, and is furnishing power to the mines, also to manufacturing indnstries in the city of Parral. The reduction mill at Parral, leased by this company, has been eqnipped with electric motors and will now be driven electrically. The company's new machine-shop is crowded with work, and an addition is likely.

Work on the Adela gronp in the Azules camp of the Santa Barbara district is being advanced. A tunnel is being driven to cut the veins, and is now 1,525 ft. long. At this distance, and at a depth of 1,300 ft., a blind vein has been cut. This vein is seven feet wide and assays as high as $22.32 in gold, with 32 oz. silver per ton. According to J. F. Hutchins, the manager, it is the intention to continue development work, and at the same time to drive the adit until the big Adela vein is cut, which it is estimated will be at 1,625 ft. from the month. The Adela group is owned by W. V. Pettit.——The Carvoid Mining Co. is developing its properties in the Parral district. This is called the Catarica group, and consists of four denouncements. The development consists of a 170-ft. vertical shaft, with a 130-ft. drift to the south at the 70-ft. level. The vein is from 4 to 14 ft. wide, giving a sulphide ore; that from the drift assays 9% lead, 17% zinc, 2½ gm. gold, and 6 oz. silver. In the bottom, the ore is better, and contains two per cent copper. It is the intention to continue sinking, and, with drifts at the different levels, fully to develop the property, and then to erect a small concentrating plant at the mine, unless in the meantime a custom concentrating plant has been erected in the district. W. E. Brock of Parral is the manager.

In the Santa Barbara district, the Los Bronces workings are down 300 ft., and at this level drifts and crosscuts are being advanced. This group of 25 pertenencias lies directly west of, and adjoins, the big mine of the San Francisco del Oro. The owners are the Messrs. McCausland, formerly of the Clarinas mine, which has but recently been sold. Ross McCausland states that it is their intention to develop these properties to the 500-ft. level, and only take out the ore necessary in working. The ore contains lead and silver, also gold and copper, and is similar in character to that of the San Francisco del Oro; it will apparently require the same treatment.

The Santiago group has recently been purchased by Nat P. Wilson, who has formed a company called the Santiago Mining Co., the principal stockholder being George I. Green of St. Joseph, Mo. This group comprises the San Nicolas and the Mina Grande, and lies in the central part of the Santa Barbara district, close to the Tecolotes. Extensive development work has been started under the personal management of Mr. Wilson, who is now sinking four shafts. Mr. Wilson says he will push work sufficiently to justify the erection of a milling plant, the first unit of which is expected to be built this fall. It is stated that there is a large amount of ore available from work done by the Spaniards in former years. The ore is valuable for lead and silver, but it contains also gold and copper. For immediate use a 200-h.p. steam-plant will be erected to operate the hoists, until electric power is brought into this part of the district.

Calumet, Michigan.

Navigation Opens.—General Activity Expected.—New Interests of Calumet & Hecla.

Spring has finally arrived in the Lake Superior copper district. The snow is melting rapidly and with a week more of such weather the snow will be gone, and the ground fit for exploration. Navigation has opened at copper country ports, and while the ice in Big Portage is too thick to permit boats to pass through Portage Entry, lake steamers are entering Portage Lake through the ship canal. Rail shipments of copper have ceased and copper is now being forwarded to the Eastern seaboard by the mixed lake-and-rail route, which means a saving of one-fifth of a cent per pound in freight charges.

From every indication the coming summer will be one of the most active in the history of the Lake Superior copper district. There will be exceptional activity in exploration, influenced, no doubt, by the high price of the metal. Work at the Centennial and Allouez mines, which recently passed into the control of the Calumet & Hecla Mining Co., is under the direction of that corporation's head officials in this district. Walter Fitch, who was connected with the Lake Superior iron industry for many years previous to his departure from Michigan for Salt Lake, where he took the position of general manager of the United States Mining Co., arrived in Calumet a short time ago to take the position of first assistant superintendent of the Calumet & Hecla interests.

At the Calumet & Hecla mines, great activity is manifested. The shafts on the Calumet conglomerate are furnishing upward of 5,000 tons of ore daily. The shafts on the Osceola amygdaloid also are furnishing a large tonnage, though not one-fifth that of conglomerate workings. Some ore is being shipped from the new shafts on the Kearsarge amygdaloid, but the production from that portion of the property has not yet reached large proportions.

At the Superior mine, in Section 15, which is controlled by the Calumet & Hecla, the openings are in ground of an encouraging nature. Sinking is being carried forward steadily and the drifts are being extended as rapidly as possible.

The La Salle company, a subsidiary company of the Calumet & Hecla, is developing its property as rapidly as the work can be accomplished. The Tecumseh, which forms part of the property, is shipping ore to the Calumet & Hecla stamp-mills at Lake Linden, having discontinued making shipments to the Franklin mill. The two shafts on the Caldwell portion of the La Salle are going down steadily, but have not yet reached much depth. The openings in the lower levels of the Tecumseh's No. 1 shaft are in good ore.——The Franklin Mining Co. is reopening the workings on the Pewabic amygdaloid that were closed down a few years ago, as the management believes they will return good profits on the present metal market. The workings on the conglomerate, at the Junior branch of the mine, are showing up well; No. 2 shaft in particular is encouraging, the lower openings being in good ground south of the shaft.——At the Rhode Island, a small force is employed in exploratory work, diamond-drill work being under way. The situation is not encouraging and the management is directing its efforts at present on the Kearsarge amygdaloid bed.

At the Tamarack mine there are still evidences of fire in No. 1 shaft, and no work is being done in that portion of the mine. The fire in the Tamarack started a year ago last January, originating in No. 2 shaft. No. 2 was idle for a year, but has been in commission the last few months. The fire appears to have drawn off into the

workings tributary to No. 1. As the latter has not been an important producer for many years, the fact that it is closed down does not mean that the Tamarack's production is suffering. No. 5 shaft is producing an excellent tonnage of high-grade ore and so is No. 3, which is the deepest shaft in the world.——The Quincy's production is now at the rate of approximately 21,000,000 lb. refined copper per annum. It is estimated that the company will earn sufficient money this year to pay its present dividends of $18 per share per annum, place $500,000 in the surplus, and care for considerable construction work, which has been deferred for the last two or three years.

It is expected that the Mohawk will sink another shaft this summer. It will be known as No. 6 and will be about 1,200 ft. south of No. 5. The latter is opening some excellent copper ground and is becoming a factor of importance in production. The Mohawk company is increasing its working force just as rapidly as men can be obtained and the production will be considerably larger before the end of the year. Improvements are being made at the stamp-mill.

The Ojibway Mining Co., a new concern organized several weeks ago by the Cole-Ryan syndicate, will begin exploratory work on its property in Keweenaw county in a short time. Capt. Thomas Hoatson of Calumet, mining director for the Keweenaw Copper Co., will be superintendent. The Ojibway lands were partially explored under the supervision of Dr. L. L. Hubbard of Houghton, former State geologist, before they were taken over by the present company. Some rich diamond-drill cores were obtained.

Each rectangle is a township, six miles square.

Key to Mines.

1.	Ætna	19.	Tamarack
2.	Empire	20.	Osceola
3.	Delaware	21.	Tecumseh
4.	Amygdaloid	22.	Rhode Island
5.	Copper Falls	23.	Franklin, Jr
6.	Central	24.	Franklin
7.	Phœnix	25.	Arcadian
8.	Cliff	26.	Quincy
9.	Mohawk	27.	Isle Royale
10.	Ahmeek	28.	Atlantic
11.	Allouez	29.	Baltic
12.	N. Kearsarge	30.	Trimountain
13.	Wolverine	31.	Champion
14.	Mayflower	32.	Belt
15.	Centennial	33.	Adventure
16.	Tamarack Jr	34.	Mass
17.	S. Kearsarge	35.	Michigan
18.	Calumet & Hecla	36.	Victoria
		37.	Winona

The Copper Region of Lake Superior.

Denver, Colorado.

The Cripple Creek Adit.—Mining on School Land.—Successful Leasing.—Oil Refinery at Boulder.—Activity Among Prospectors.

The formal inception of work on the new deep drainage adit at Cripple Creek is to be marked by considerable ceremony. On Saturday, May 18, Governor Buchtel will press the gold button starting the power-plant at the mouth of the adit. A large party of representative mining men from Denver, accompanied by a band, will arrive on a special train, and the mining men of Colorado Springs are expected to attend in a body, while delegations from Pueblo and other towns are also expected to be present. The ceremony will signify, in an appropriate way, the recognition of the high importance of the drainage project, and at the same time serve as an opportunity for pleasant social intercourse among the men whose business it is to "follow the pay-streak."

It is a most unusual thing for the public schools to appear in the role of mine-owner. This peculiar state of affairs is the result of the leasing operation on the Bull Hill school section, near Cameron. But as only four per cent royalty is exacted by the State, the lessees bid fair to profit much more by their operations than does the public school system. Incidentally, many of the lessees of the mines in the Cripple Creek district make substantial profits from their operations. A recent lease, just terminated, reports a net profit of $250,000 from eighteen months' operation. Many others have similarly done well. Whatever may be said of the leasing system from the standpoint of the management, it at least offers opportunity for men with a small amount of capital and a large amount of push and skill to reap the reward they deserve.

The erection of an oil refinery just east of Boulder is under way, which means a corresponding stimulus to the oil industry of that area. But the ebb and flow of industrial development present some curious phases to the enquiring mind. Not many years ago the lead smelters of the State possessed well-equipped desilverizing plants. Now they are, without exception, closed down. With the cessation of the buying of silver for coinage at the Western mints, the only market for that metal was in the East. Silver and gold locked up in base bullion can be shipped safely, at a low freight-rate. Separated and refined they must go by express at high cost. Labor is cheaper in the East, also. So the Colorado plants are now shippers of base bullion, and the desilverizing and refining plants stand silent and empty.

Like the "New Year reviving old Desires" the first breath of spring wakes the prospector to the call of the hills. The local papers of the State are filled with the buzz of the incipient egress of the prospector with his camp-kit and pack of grub upon the back of his patient burro. Routt county and the San Juan region manifest the greatest activity. Prospecting in the former is stimulated by the western progress of the Denver Northwestern & Pacific, or 'Moffat,' railroad. Most of the reports come from the Hahns Peak region, which, like the northward extension into Wyoming, has so far yielded little but expectations. Routt county is large and it is to be hoped that other parts of it will yield handsomely. The San Juan country is one of great promise still, and the prospector does well who throws in his lot there.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

REPEATED tests on carefully cleaned boiler plate, gave an average specific gravity of 7.932.

A PURE IRON, if it could be obtained, without carbon, phosphorus, manganese, silicon, or sulphur, would have a tensile strength of 34,750 lb. per sq. in., if tested in a ⅜-in. plate.

COMMON HIGH BRASS contains 61.5% copper and 38.5% zinc. Cartridge brass contains two parts of copper to one of zinc, and low brass is composed of 80% copper and 20% zinc.

THE exact efficiency of a particular turbine wheel must be found by experiment. It is considered hardly possible for the efficiency to equal 86%, and a turbine yielding 75 to 80% is extremely good.

THE stability of a dam against overturning about its lower edge is calculated by comparing its statical moment referred to that edge, with the resultant pressure of the water against its upper side.

IN THE Howe bridge truss, the diagonals are struts and the verticals are ties, while in the Warren girder, or triangular truss, there are no vertical struts, and the diagonals may transmit either tension or compression.

WIRE ROPE is as pliable as new hemp rope of the same strength, and the former will run over the same-sized sheaves and pulleys as the latter. But the greater the diameter of the sheaves, pulleys, or drums, the longer the wire rope will last.

A POUND of coal used to make steam for a fairly efficient refrigerating machine can produce an actual cooling effect equal to that produced by the melting of 16 to 46 lb. of ice, the amount varying with the conditions of working.

THE proponent of the inquiry concerning the location of claims by deputy mine surveyors is advised to employ a lawyer. He has been sued, according to his own statement, and he must have someone employed to look after his case. If not, he needs someone sadly. The MINING AND SCIENTIFIC PRESS has heretofore presented the question of the rights of deputy mine surveyors and the validity of locations made by them.

IN VENTILATING a mine or other underground passage, the resistance to be overcome is proportional to the extent of the frictional surface exposed; that is, to the product of the length of the gangway by its perimeter, to the density of the air in circulation, to the square of its average speed, and to a coefficient whose numerical value varies according to the nature of the sides of the gangway and the irregularities of its course.

GROUND MICA is used in some quantity, the coarser grades in mica bronzes and paints and also as an absorbent for explosives. Ground mica also forms an ingredient in some heavy lubricants. The finest ground mica or mica flour finds a considerable market with the manufacturers of high-grade wall papers, the lustre obtained by the use of the muscovite dust having the advantage of both permanency and brilliancy.

SCRAP MICA is utilized in the manufacture of a superior quality of boiler lagging, a mat of finely divided mica flakes furnishing a fireproof covering that has sufficient strength to be durable, not disintegrating like some other materials, and excelling asbestos and magnesia compounds as a non-conductor of heat. The superiority of the mica lagging appears to depend not only upon the low conductivity of the mineral itself, but especially upon the loose texture of the mica mat.

RAPIDLY as the population of the United States has increased, the lumber consumption has increased still more rapidly. In round numbers, and allowing for incomplete reports, the lumber cut in 1880 was 18 billion feet; in 1890, 24 billion feet, and in 1900, 35 billion feet. The increase in population from 1880 to 1900 was 52%, but in lumber cut, 94%. The United States is now using annually 400 board feet of lumber per capita, while the average for Europe is but 60 ft. per capita.

WHEN properly made, malleable cast iron should have a tensile strength of 42,000 to 48,000 lb. per sq. in., with an elongation of 5% in 2 in. Bars 1 in. square and on supports 12 in. apart should show a transverse strength of 2,500 to 3,500 lb., with a deflection of at least one-half inch. The resilience should be at least eight times that of cast iron. Malleable cast iron can be bent, twisted, and abused before giving way, thus making the material ideal for service where a fair tensile strength is required, but especially where often repeated shocks are the rule.

CALCIUM STEEL is a ceramic product formed by baking a paste made of finely pulverized feldspar, sand, and lime, mixed in certain proportions. The product has remarkable qualities, being a porcelain or earthenware of great hardness and durability. It resists corrosion by acids, is a poor conductor of heat and electricity, and has a specific gravity of only 3.3. Although hard, the material is tough, and can be machined like metals, being readily bored, cut, planed, or polished. One of the uses for which it is expected to prove valuable is for pipes and conduits for water, gas, and chemicals.

PURE COPPER cannot be cast in sand without difficulty; in fact, some deoxidizer is always used. For common copper castings from 2 to 5% zinc is generally added to get sound castings; but for electrical work this is useless. The only way to get good electrical castings is to melt pure electrolytic copper in a plumbago crucible under a thick layer of charcoal. When thoroughly melted, add 2% silicon copper and stir it in with a stick, and cast as soon as ready. Practical experience alone will show the correct temperature for casting copper in sand molds, and the proper temper of the sand. It must not be cast boiling, but a fairly high temperature is necessary.

THE process of making malleable cast iron may be briefly summarized as follows: The proper irons are melted in either the crucible, the air furnace, the open-hearth furnace, or the cupola. The metal when cast into the sand molds must chill white or not more than just a little mottled. After rolling off the sand from the hard castings they go into the annealing department, where they are packed in puddle scale, or other materials containing iron oxide, and here subjected to a period of red heat (1,250 to 1,350° F.), over 60 hours after reaching the proper temperature. They are then cooled gradually, rolled again to remove adhering scale, chipped or ground, straightened, and shipped.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Copper in Shasta County, California.

The Editor:

Sir—I have read with great interest the article of Mr. Donald F. Campbell on the geology of the Shasta copper belt in your issue of January 5. The efforts of Mr. Campbell to shed some light on the local geology must be highly appreciated by all engineers, as reliable information on the geology of that important district is much needed. In fact, as far as I know, the articles of Mr. J. S. Diller in bulletins No. 213 and 225 of the United States Geological Survey, and his text in the folio devoted to the Redding Quadrangle are the only sources of information at hand. Any reliable contribution to this subject must then be of immediate value to all mining engineers called to work in that district, and if in the following lines I may differ from some views of Mr. Campbell, I do this, not in a spirit of criticism, but in the hope that other men more fully acquainted with the local geology will give us the results of their observations.

The genesis of the orebodies is the most important question from an economic standpoint. This, once understood, gives a reliable basis for considerations as to the probable position and arrangement of the orebodies.

The conditions in the portions of the belt on the opposite sides of the Sacramento river are very different and the two areas must be treated separately.

The rhyolite belt west of the Sacramento river, called the Balaklala rhyolite (U. S. G. S. Redding Quadrangle), is formed by a succession of flows, and I do not doubt but that by careful study the various flows might be differentiated in the underground workings. The question is whether the ore deposits are confined to one or more flows, or are distributed through the entire rhyolite mass. The fact that, as yet, no ore deposits have been found in the Copley andesite may be a lead in this direction.

It would also be interesting to have a careful chemical study made of the rhyolite, to determine whether that rock contains a minute quantity of copper, although even microscopically not observable. This was found to be the case in the Encampment district of Wyoming.*

It must further be noted that often, at a relatively considerable distance from the large orebodies, small aggregates of sulphides are found, principally chalcopyrite, associated with secondary silica. Why these small aggregates are so much higher in copper, or, in other words, why in these smaller aggregates pyrite forms a small portion of the sulphide deposit, while in the larger deposits it forms by far the major portion of the sulphides, is another question that demands elucidation. Assuming the generally accepted theory that these ore deposits formed in shear-zones in the rhyolite, it must be observed that the silicification of the rhyolite mentioned by Mr. Campbell is at least, to a certain extent, posterior to the formation of the sulphides. A microscopic examination will show that some of the pyrite crystals are fractured, and silica has been deposited in the fracture planes.

The section given by Mr. Campbell of the Iron Mountain deposits indicates, in my opinion, that the deposits on the north slope of the mountain (Hornet mine) have most probably at one time formed one deposit, which has been subsequently faulted. Some of the other deposits in the same district clearly indicate a similar history. The down-throw of these faults is, as far as determined at present, northerly. This leads me to the suggestion that the movements that caused this faulting were associated with the volcanic disturbances in the Mount Shasta region, and a sinking of the surface in that vicinity at the close of those eruptions. This faulting may reasonably account for the dispositions of the orebodies as found at present (See Fig. 1, 2, and 3), especially if we consider that, before causing faulting, a folding of the strata may have caused the formation of monoclines. If my information is correct, the deposit in the Mammoth mine lies in the form of a saddle and a reconstruction of the Iron Mountain section given by Mr. Campbell would probably give a similar form. (See Fig. 4.)

Up to the present time no intrusives have been ascertained in the Balaklala rhyolite; the copper in the solution must then either have been derived from underlying formations, or have been leached out of the rhyolite, a possibility to which I have already alluded. I incline to the former idea, especially in view of the character of the Bully Hill deposits.

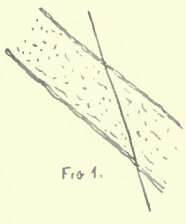


Fig 1.

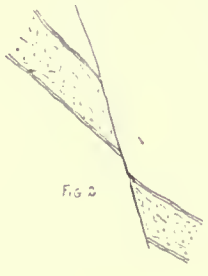


Fig 2

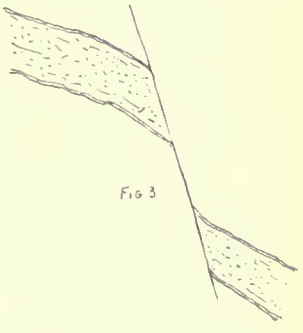


Fig 3

The characteristics of the deposits east of the Sacramento river differ in many particulars from those in the western portion of the Shasta County copper belt.

The ore deposits are situated in a zone of mineralization, which has a northeastern strike and a steep dip.

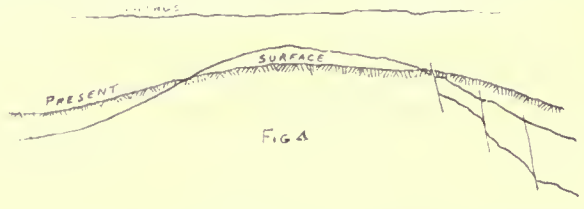


Fig 4

This zone is contained within a body of rhyolite, the Bully Hill rhyolite. This rhyolite forms an I, the Bully Hill and adjoining mines are on its north branch, some copper ore deposits are found in its stem where it crosses the Pit river, and the Afterthought mine is located on its southern branch. In this district the copper deposits are, however, not restricted to the rhyolite. Some are found in the Dekkas andesite. According to Diller, the Dekkas andesite and the Bully Hill rhyolite are Triassic and consequently much younger than the pre-Devonian Copley meta-andesite and the Balaklala rhyolite. In the Bully Hill district there are intrusions of a diabasic rock in the rhyolite. The rhyolite is much more sheared than west of the Sacramento river; the shearing is so intense that in places it has a perfect laminated structure.

Of the three main ore deposits in the vicinity of Bully hill, the Winthrop, the Rising Star, and the Bully Hill, only the last is directly associated with the diabasic in-

*Arthur C. Spencer, U. S. G. S. Prof. Paper No. 25, p. 35.

trusion, which forms the east or hanging wall. This intrusion is not noted on the sheet of the structural geology, as given in the 'Redding Quadrangle' of the U. S Geological Survey. Exposures of similar intrusions are fouud at other places in the area of the Bully Hill rhyolite.

The orebodies are lenticular in form, but their vertical axis is far in excess of their horizontal axis. In the Bully Hill mine, the vein has persisted to a depth of 900 ft. and is still strong at that depth.

There is not only a structural difference between the ore deposits east and west of the Sacramento river, but also a pronounced mineralogical difference. The ores of the Bully Hill district are richer in gold and silver, and a conspicuous percentage of zinc-blende. Their copper content is also much higher, and the secondary enrichment is far more important than west of the Sacramento river and more persistent in depth. The bottom has not yet been reached in the Bully Hill mine.

There is every reason to assume that the ore deposits in both portions of the Shasta County copper belt have been formed during the great post-Jurassic disturbance of the Sierra region. While the data in my possession are not sufficient to state positively that the ore deposits west of the river are restricted to certain flows, or to certain differentiation in the Balaklala rhyolite, there are some indications that the material enclosing those deposits differs from that at a distance from the orebodies, more especially in the classification of the feldspars, which in the latter belong more prominently to the soda-lime series.

The presence of more basic intrusives reaching the surface in the Bully Hill district justifies the hypothesis that here a magmatic differentiation has taken place, that the ascending waters obtained their metallic solutions from the more basic material, and deposited the minerals in fracture-planes of the overlying more silicious portions, the later intrusions of the more basic portions into the overlying strata taking place along the same lines of weakness in those strata.

West of the Sacramento river, no such basic intrusions have as yet been exposed. There is a possibility that similar magmatic differentiation has taken place in depth, and that these underlying basic portions have not been intruded into the overlying more silicious material, but yet have been the source from which the ascending waters have obtained their metallic charges.

It may also be that the hypothesis of a magmatic differentiation is in both cases erroneous, and that the ascending waters obtained their metallic charges from a more deeply seated source. This view is partially confirmed by the fact that the pyrite in the country rock is not an original constituent of the rock.

All these points can only be fully determined by a detailed study. The able mining engineers who conduct the various enterprises in this belt are in position to solve them, and to them we must look for more positive data.

WILLIAM FORSTNER.

San Francisco, May 8.

Acetylene Lamps.

The Editor:

Sir—I observed in your recent article on Guanajuato a reference to acetylene lamps. Possibly the following may interest you:

At the Newhouse Tunnel we first tried, some six months ago, to substitute acetylene lamps for candles in the headings, with the object of securing better light. We are now using them exclusively, except at points along the main tunnel which can be illuminated by incandescent lamps taking their current from the trolley line.

The lamps we use are of the Wolf pattern, cost $2.25 each, and weigh 2¼ lb. empty, or 4 lb. fully charged. The receptacle for carbide when full holds half a pound, which will burn for from 12 to 14 hours.

The light given depends on the rate of admission of water to the generating chamber, and this can be closely regulated by turning a screw on the outside of the lamp. We have never measured the intensity of the light, but it must be equal to that of at least six candles. In places where candles can only be used enclosed in a can ('bug' or 'go-devil') the acetylene flame needs no shield excepting the reflector behind it.

Carbide costs us 6c. per lb. delivered at Idaho Springs, in ton lots. We find the average expense per lamp per month to be approximately $1, of which 90c. is for carbide and 10c. for repairs. Candles cost about $2 per man per month, excepting in draughty places, around machine drills, etc., when they are excessively wasteful and unsatisfactory, and probably cost more than twice this rate.

All our lamps are stamped with a number, and each man is held responsible for his own lamp. They are cleaned and filled by the enginemen on spare time, and no account is taken of the cost of cleaning and filling, in the estimate of monthly cost. The lamps are left in the power-house by the men to whom they have been allotted, on going off shift, and are ready for use when called for next shift.

We have had no complaint whatever in respect of headaches, even from the men who clean and fill the lamps. This may be due to the altitude; I have noticed that headaches from handling dynamite, etc., are more severe and frequent at lower altitudes. I have tried other types of acetylene lamps elsewhere, and found them troublesome; but can recommend these for use in mines where they can be properly cared for.

GEORGE E. COLLINS.

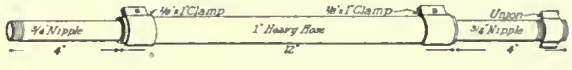
Denver, April 29.

An Idea.

The Editor:

Sir—Some years since I discovered that in mines where machine-drills were used a great deal of labor and air-pipe was lost in turns and sharp bends in drifts, stopes, and in other places in mines where air-pipes had to be placed.

The following device I have used for some time, and have often wondered why no one thought of it before: For ¾-in. pipe, use pieces of 1-in. heavy hose (old air hose will do) 12 in. long, with 4-in. by ¾-in. nipple



screwed into each end of hose and clamped in with clamps, ⅛-in. by 1-in. iron, around the hose at each end. Unions can be attached to one or both nipples for convenience, or not used at all, as desired. If 1-in. pipe, use 1¼-in. hose and 1-in. nipples, and for 2-in. pipe, 2½-in. steam hose can be used to advantage. If the nipples are warmed just before putting into the hose they will be sure to be air-tight. Application has been made for a patent.

W. S. HASKINS.

April 27.

[Such suggestions are most useful. We thank Mr. Haskins cordially.—Editor.]

ADEQUATE ventilation is one of the best preservatives for timber. A steamy atmosphere may rot 12-in. Oregon pine in six or eight weeks. Timber with cold water dripping on it will last longer than that in a dry drift, as the spores of dry rot are washed off the wet sets.

Metallurgical Development at Guanajuato.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

It is worth while to tell the story of the metallurgical development at the Sirena mill, more properly named *La Hacienda San Francisco de Pastita*. The successor to the old *patio* was a mill erected in 1899; it contained 20 stamps, each weighing 1,250 lb. The ore first passed through a 9 by 15-in. Blake crusher and was then reduced to 20-mesh by the stamps, from which it passed to six Boss rapid-grinding pans. Here it was re-ground, so that all save 5 to 10% passed an 80-mesh screen; and then it descended to 12 more pans and six settlers. From these the pulp went to five Wilfley tables. The capacity of the mill was 1,500 to 1,800 tons per month. The product was amalgam and concentrate.

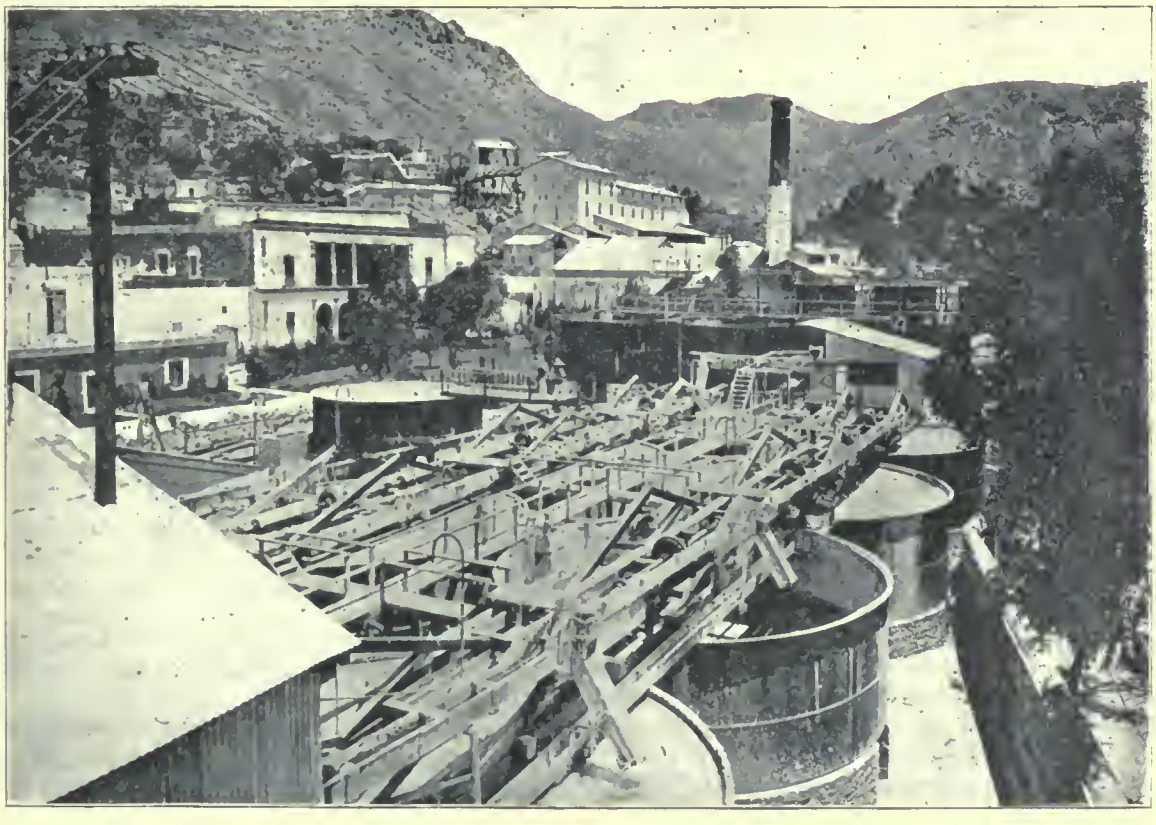
The pans extracted 65% of the assay-value and the concentrate contained 12% more. This was on the oxidized ore. Although the concentrate contained 2 kilo. or 61.2 oz. silver, it barely paid to send it to market under the smelter conditions then existing in that part of Mexico. However, another factor came into play; as the lower workings were opened up, the percentage of recovery by amalgamation fell off until it was only 60%. Concurrently, the consumption of mercury and copper sulphate in the pans increased, while the concentrate became richer—5 to 7 kilo. silver per ton. The method was changed; concentration was made to precede pan amalgamation.

By this new arrangement, the cost of milling was reduced from 7.86 *pesos* to 4.81. The concentration was carried further, so that the product contained 10 to 11 kilo. silver and 115 grams gold per ton; yet the weight of concentrate remained at two per cent of the crude ore. The higher recovery by concentration balanced the lower yield by amalgamation, the commercial result being less satisfactory because the precious metals in the form of amalgam were worth more than when enclosed within a concentrate that had to be transported to a distant smelter. Moreover, the variation in smelter rates introduced a factor of uncertainty.

Extraction finally fell below 60%. This suggested an increase in the mill, so as to lower the fixed charges. At this period the Government tax and the expenses in connection with realization of bullion amounted to 11% of its gross value. The poor extraction and the high imposts left but a small margin of profit. A search for better metallurgical treatment was undertaken. The cyanidation tests made by Leonard Holms in 1901 did not seem to justify turning to that method at that time; subsequently, however, E. M. Hamilton made a new research on a working basis, with a 5-ton plant, and he obtained encouraging results. However, nothing was done for a year.

Meanwhile the recovery by amalgamation continued to dwindle and when cyanidation was recommenced, there was a fear lest the further change in the ore with depth might affect extraction by cyanide as it had done that by mercury. In 1901, Bernard MacDonald was engaged to investigate the problem, with the idea, among others, that the Hendryx process might be applied. Complete cyanide tests were made and every kind of ore in the mine was tried. The results fully confirmed Hamilton's earlier work, even on the ore from the bottom of the Sirena mine. It was demonstrated that finer grinding was required and that even the concentrate, if ground dry to pass through 200 mesh, would yield 94 to 96% with the use of a 2.5% cyanide solution—a solution unusually strong, but based upon the relative proportion of silver to be dissolved. A weaker solution would have done better, as was proved later.

In these tests, a fresh solution was introduced each 24 hours into bottles that were agitated by being attached to the periphery of a slowly revolving wheel. This failed to reproduce working conditions, because it eliminated a drawback inevitable in practice—that is, foul solutions. For this reason the results were higher than was to be expected in the mill, but they warranted the belief that a plant specially designed for the treatment of



Reduction Works of the Guanajuato Con. Mining Company.

the concentrate, would yield larger profits than the sale of the concentrate to the smelters. The tests demonstrated also that the silver sulphide was readily attacked by cyanide when the grinding was as fine as 200 mesh. As yet, no plant has been erected to treat the concentrate, but it is likely that this will be done.

In the meanwhile—this was in April, 1904—it was decided to erect the existing cyanide plant, which started to work in May, 1905. When concentration was made to precede amalgamation, the grinding in pans was discontinued, it being found that amalgamation was most effective in charges instead of the continuous process. In erecting the cyanide annex, the only change required was to divert the flow from the Wilfley tables to cone-classifiers. The coarse sand went to a tube-mill of Allis-Chalmers make, 5 ft. diam. and 22 ft. long. It was lined with chilled iron, which, after a three weeks' run, collapsed, so that the use of the tube stopped abruptly. It has not been employed since. Tests proved that the benefit of the re-grinding in the tube hardly warranted the extra expense of repairs and power. The first cone-classifiers went out of commission, the pulp going from the Wilfleys to a set of cone-classifiers that separate the sand from the slime. The arrangement is shown herewith, in Fig. 1. *A* is a large spitzkasten, 8 ft. wide and 8 ft. deep, the classification being by gravity. The sand, plus some slime, flows through rubber goose-necks to a height two feet above the bottom into four smaller cones or spitzlutten, 4 ft. wide and 4 ft. deep, equipped with hydraulic jets. The undersize from all five cones unites to flow to eight Callow steel settling-cones, 8 ft. diam. and 8 ft. deep, where it is de-watered. Thence the pulp passes to three masonry vats, where lime is added to effect settling previous to decantation, at the same time destroying the acidity of the slime and bringing the positive alkalinity up to 1½ lb. lime per ton. Then this slime is pumped to the treatment-vats, the sand meanwhile going to collecting-vats from which it is taken, after draining, in cars to the treatment-vats.

This was the scheme at the commencement of cyanidation; subsequently the masonry vats, formerly employed in de-watering the pulp previous to pan amalgamation, were modified so as to serve for holding and thickening the slime. The five cone-classifiers were moved into the stamp-mill, in order not to lose grade, and in this new position they delivered direct into the masonry vats behind the old amalgamation pans, the vats built in the cyanide annex being used for the same purpose, namely, to de-water the slime. Even now it contains 70% water, and this 70% is just so much liquid that has to be displaced by the effective cyanide solution, until perfect diffusion is attained.

The ore goes from the Sirena mine to the mill in cars (Kilburn & Jacobs) of 50-cu. ft. capacity, carrying 2.4 tons each. They have a double side-dump, with gable bottom, and appear to work easily. Waste is removed by sorting in the big courtyard at the entrance of the main adit. A sorting belt is to be used at the new Soledad shaft, the waste then eliminated to be returned into the mine as filling. The belt is to be 50 ft. long, giving room for five men on each side and illuminated like a billiard table by shaded electric lights. Each man is to sit astride a wooden horse, which is high enough to give freedom of reach over the belt.

Gold can be seen in the surface ores of the Sirena mine; it accompanies the argentite. Pyrite does not appear to be indicative, nor is it a close associate, of the precious metals; it is more plentiful in the undigested country rock. In the ore of the Peregrina mine there is a little arsenical pyrite and also traces of antimonial silver minerals At Guanajuato generally, the average yield of concentrate does not exceed two per cent, carrying 150 to 1,600 oz. silver, and from 1 to 30 oz. gold per ton, so that the problem is to treat a small quantity of high-grade material, in competition with the expensive freight charges of the railroads and the heavy treatment rates of the smelters. Further, the Government tax is one per cent less on bullion than it is on the precious metals when in the form of concentrate.

In September, 1905, the mill treated 3,887 tons of ore, containing 517 grams of silver and 2.76 grams of gold per ton. On leaving the concentrators the pulp assayed 302.5 gm. silver and 1.46 gm. gold. The concentrate recovered amounted to 106 tons, averaging 948.06 gm. silver and 46.92 gm. gold. The cost of crushing and concentration amounted to 1.75 *pesos* per ton. The extraction by concentration was 50.1% of the silver and 49.1% of the gold.

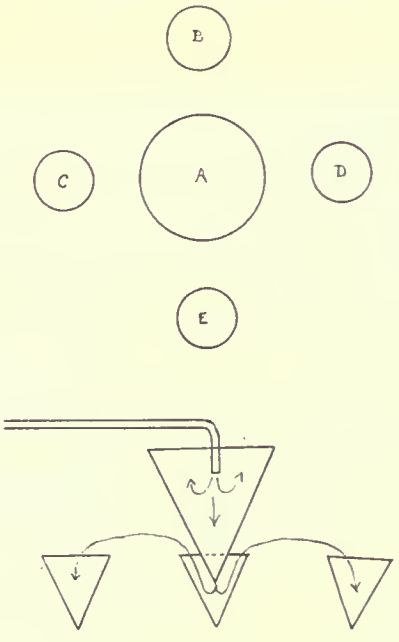


Fig. 1.

The practice is still in course of development and experiments are continually being made. Re-grinding does not seem required by the Sirena ore; it is stamped through a diagonal-slot screen equivalent to 40 mesh; a chuck-block is used. Of the resulting pulp, 80% goes through 100 mesh. The granular quartz, when crushed, readily liberates the silver sulphide, but the chalcedonic gangue in which the silver occurs (in a cloudy dissemination like moss agate), needs fine grinding—all of it—to pass at least 100 mesh. The concentrate carries 30% silica; the portion that passes through 200 mesh represents 15.5% by weight and as it is worth 398 *pesos* per ton, it contains 42% of the assay-value of the ore.

In watching the agitation in the slime vats, it was noticeable how the circular motion becomes accelerated until the moving mass of pulp and solution moves faster than the paddles. On starting the agitation, one can see the sinuous streaks of clear cyanide solution amid the slime, and this condition of imperfect dispersion is never wholly overcome; it is due to the resistance of slime to diffusion. I noticed this appearance (or phenomenou) in a vat that had been at work for 40 minutes. Another note; even ten minutes after the agitator is stopped, the movement of water at top of the vat continues in the direction started by the paddles. Two pounds of lime are added per ton of solution in order to hasten settlement of the slime. The philosophy of this has been discussed in connection with milling at El Oro.

The loss of sodium cyanide at the Sirena mill is 4.12 lb. per ton of crude ore, while the consumption of lime is at the rate of 6 lb., worth 12 *pesos* per metric ton. Sodium cyanide costs $15.75 per metric ton at Marfil station, the present terminus of the Mexican Central railroad, and to this must be added 1.25 *pesos*, or, say, 60 cents, for transport to the works, making the total cost $16.35 per metric ton of 2,204 pounds.

There is always some re-precipitation when treating silver sulphide, by reason of the formation of potassium sulphide, but this is diminished by the addition of lead acetate, which forms a plumbous hydrate that removes the soluble sulphides by forming a lead sulphide and the potassium or sodium hydrate. In practice, the re-precipitation of silver is surpassed by the re-dissolving of it in the cyanide solution.

By passing through cone-classifiers the product escaping from the upper mill is divided into 'sand' and 'slime,' which are treated separately, or in the cyanide annex. In the 'sand' department there were 20 vats, each containing an average charge of 2,651.7 cu. ft., or 89.6 tons. During the month 1,792 tons (dry) of sand was treated. The average assay-value before treatment was 297.5 gm. silver and 1.37 gm. gold; after treatment the contents were 52 gm. silver and 0.1 gm. gold. In the 'slime' department, there were 82 vats, each containing 3,851.8 cu. ft. of wet slime, equivalent to 24.26 tons dry. During the month 1,989 tons were treated. The average assay-value before treatment was 275.5 gm. silver and 1.3 gm. gold. After treatment the assay became 45.5 gm. silver and 0.1 gm. gold. The extraction was 85.1% as regards the silver and 70% of the gold in the pulp treated by the cyanide annex, the total recovery by cyanidation being 41% of the assay-value of the crude ore, so that the combined extraction by cyanidation and concentration was 91.2 per cent. The total cost of cyanidation was $1.13, and the consumption of cyanide 1.9 kilo. per ton.

Note should be made of the fact that successful experiments with cyanide on silver ore had been made earlier at the mines in Sinaloa, but the results had not been heralded because they were obtained at private properties, and even in these cases the official tests of the cyanide company at Mexico City had discouraged hope. The trouble was due to the use of too weak a solution—a swing of the pendulum in cyanide practice, for in its early days the main fault was the employment of a needlessly strong solution. Another factor, that prevented success with these silver ores, was the insufficient time given for chemical action. The element of time is especially important in the case of concentrate—iron pyrite carrying gold free and silver as argentite; the millman can afford to give the time required because of the small quantity of this product and its richness.

THE distance and direction in which power may be transmitted by rope-drives, using a large number of ropes, is practically unlimited. Satisfactory driving may be done where the distance between shafts is as great as 80 to 90 ft. without the aid of carrying-pulleys, while with such carriers the distance may be prolonged almost indefinitely. On the other hand successful driving can be done with ropes where the shafts are close together. There are many drives in operation whose sheaves are but 10 ft. or less, centre to centre. Where shafts are neither in the same line or plane, by properly placed guide-sheaves power may be transmitted around corners from one building to another, and in short between any two shafts in whatever relative position they may be.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

In an action to settle conflicting rights to a mining claim where the complaint is sufficient and where a sufficient adverse claim had been filed, a verdict in the form, "We, the jury, find the defendant guilty," was held sufficient to answer all the purposes of the proceeding.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

In an action in support of an adverse to a mining claim, where a declaratory statement was introduced in evidence before any testimony had been given, showing that the steps necessary to be taken before a declaratory statement could be filed, had in fact been taken by the locator, and the statement having been followed by the necessary proof, it was held that the admission of such declaratory statement out of its order was immaterial and without prejudice. And the admission in evidence of an original declaratory statement, defective in that it failed to sufficiently describe a discovery shaft, was admissible in evidence, in connection with the amended declaratory statement, as showing an attempt on the part of the locator to comply with the law and the identity of the claim described in the two statements.

Butte Consol. Min. Co. *v.* Barker (Mont.), 89, Pac. 302 (March, '07).

A statute of Montana provides that the locator of a mining claim must sink a discovery shaft on the lode or claim to the depth of at least 10 ft., or deeper if necessary, to show a well-defined crevice or valuable deposit; but it is also provided that a cross-cut, which cuts the lode at the depth of 10 ft. below the surface, is equivalent to the discovery shaft. The statute also provides for the filing for record of a declaratory statement, which, among other things, shall state the dimensions and location of the discovery shaft or its equivalent sunk upon the claim. But under these statutes where it appeared that a cross-cut intersected the vein on a claim 132 ft. below the surface, but that the only means of reaching such cross-cut was down a shaft located upon another patented claim, it was held that such cross-cut, even if made by defendant, did not meet the requirements of the statute for development work, and no other work having been done, there was no valid location of the claim.

Butte Consol. Min. Co. *v.* Barker (Mont.), 89, Pac. 302 (March, '07).

In an action to determine the title to a mining claim the complaint or declaration should contain, in addition to the ordinary allegations in ejectment, appropriate allegations showing the fact that such action is designed as an adverse suit.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

The rule has been declared that the working of a mine for the statutory period before the adverse right exists, is equivalent to a location under the Act of Congress. As said by the Court: "In other words, a party who had done such work occupies the status and possesses the rights of a locator, no more and no less. As in the case of a holder of a valid location, he has good title as against all but the Government, so long as he does the annual labor." The holder of such a possession, no less than the holder of a location, must possess the necessary qualifications as to citizenship, and he must prove, as well as the locator, the possession of $500 worth of labor or improvements before he can secure a patent, and pending his right to patent, he must perform the annual assessment required of the locator by the statute.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

Concerning Costs.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE HUSTON.

A highly important factor in a going mining concern is its system of accounts. There are many crooks and turns in the business, there is many a colored gentleman in the woodpile, and where the abuses are greatest they are least apparent. In the organization in which the mine manager has the choice of the system, he has also an opportunity for concealment of conditions. He can, by the adoption of a certain system, make a better showing than a more capable man, and thus deprive the investor of the benefit of competitive talent. The investor is invited to study the following tale and its moral. The tale is founded on fact :

Manager No. 1 was in charge of a silver-lead property, with a fine mine and mill of 500 tons capacity. Nature had been most generous to his mine. The veins were large, heavy in commercial metal, and rather low in grade. The problem was to extract the valuable portion of the ore in order to pay a profit and provide for future development, and this with a loss in the tailing as small as was consistent with the current practice and the economic limit in costs. He did not believe in crushing a large amount of material in order to secure certain results at the expense of efficiency and the ore reserves in the mine.

In this case, the unit on which costs were based was the pound of lead and the ounce of silver extracted. That is, he figured his costs against the amount of metal extracted. His constant effort was to increase the output, at the same time keeping his costs stationary or reducing them. Thorough weighing and sampling at the mill was practiced in order to determine the pounds of lead and ounces of silver contained in the tonnage mined and treated. Every increase in output, with stationary costs, gave a larger surface on which to spread expenses, with a consequent reduction of the latter. We may add, that the gentleman was a good patron of the technical journals in more ways than one. He was a painstaking reader, always on the lookout for practical ideas; the manufacturer of improved appliances and machinery loved him, because he knew his effort would be appreciated in a substantial manner by profitable business. For this reason the technical journal enjoyed good profit from the manufacturer's advertisements and thus was repaid for its labor and talent in providing helpful reading matter for the manager.

No. 1 knew the value of up-to-date appliances. He did not hesitate to scrap old plant, if the new would improve matters. If the labor cost increased through higher wages, or if the assay of the ore ran lower than usual, he promptly turned to his plant to increase capacity or to adopt some method for higher saving at less cost, in order to provide more of a cost-carrying medium and to maintain his dividends. No. 1 knew his business from A to Z and the system kept him keyed up to his work. He always employed the best class of labor, seldom had a disagreement, realizing that his success depended on co-operation and he did his best to instill this doctrine, and thus keep the force efficient. As for the stockholders, they were proud of him. The only cost given in the reports to them were those per pound and ounce, and the prices realized. This was easy to understand and the setbacks were met by honest explanations.

It came to pass that No. 1's record got noised abroad, the result being, the receiving of flattering offers of positions giving a greater scope for the energies and talent of the man. He had earned his spurs and was really too good a man to keep in a small concern. He accepted, and Manager No. 2 was duly installed in his place.

No. 2 did not possess the energy or ability of the former incumbent. The staff and force soon got to know this and the tension was relaxed. He knew the mining end of his work but was lamentably deficient in the milling. The mill was really the profit-maker. The manager was compelled to rely on his mill-staff for efficiency, but not being master of the knowledge necessary to conduct operations, his errors led to trouble. One of his first acts was to reduce expenses, the first item to be cut off the list was the efficient sampling arrangement of his predecessor. What need was there of sampling in the mill, when the tailing was sampled and the ore also? The assay of the mill-feed could be ascertained well enough by approximation. The men took the cue, having no check put on them, and taking their own samples, got results to clear themselves. The practice promptly deteriorated, and after a three months' trial, No. 2 saw that he could not hope to equal the record of No. 1 by treating the same tonnage, wherefore he evolved a new system of cost-keeping. Instead of figuring against the pound of lead and ounce of silver recovered, he placed costs on the ton of mill-feed treated. In order to show the same number of pounds of lead and ounces of silver recovered, he jammed through the mill the additional tonnage necessary. The consequence was, the mill had to take care of 750 tons instead of 500. The machines were constantly overloaded and did poor work. There was a big loss in the tailing. The mill superintendent was harassed to keep down costs, and the plant suffered accordingly.

The argument of No. 2 was that the stockholders wanted dividends only. Having the machinery of concealment in his hands, he gave them returns at the expense of the ore reserves, in order to hide the fact that his ability as manager was below the standard established by his predecessor. He also knew that he had a cinch on the position as long as the ore reserves held out. It is true, the facts appeared to leak out when men were put to re-work the creek-bed below the mill for the metals he had thrown away. But he harassed and hampered such operations, through his influence with the transportation companies and others. Meanwhile, in the milling plant, improvements came to an end. It would not do to raise the expense, so why improve? Instead of being a thorough student of up-to-date methods and appliances, he cut out another expense; namely, the subscription list to the technical journals. Not being a patron of the manufacturer of improved appliances, the journal suffered because of the system, from failure to stimulate the manufacturers' market.

The reports furnished to the stockholders were beautiful documents, abounding in nebulous items, such as the cost per ton for screens, for crusher shells, and so forth. The American stockholder is a notoriously apathetic individual. At first they confused, then the reports were flung aside. What need to bother as long as dividends came regularly?

The baneful results of the system became apparent in the conduct of the force. The constant effort to reduce expense regardless of the extraction, undermined efficiency. The employee became a machine, whose only value was the amount of working effort he made. No recognition was given to special talent or good suggestions. Suggestions meant improvements, and improvements meant expense per ton treated, because of the extra installation required. The system grew more and more expensive through having to break in new men for skilled work at the company's expense. As fast as they were trained,

they left for a more congenial position with neighboring companies.

Here ends the story; the stockholder can draw his own conclusions.

There is no valid reason why a system of cost-keeping cannot be evolved to render the operations of such managers as No. 2 impossible. There should be healthy rivalry between managers, just as in any other business. Three months of office for manager No. 2 on No. 1's system would have demonstrated his incompetency and resulted in his displacement. Had the stockholders been alive to one check, that of doing the sampling at the mill independently, in their own interest, they could have prevented the abuse of the ore reserves, in his effort to conceal deficiencies. Manager No. 1 was a good man, but No. 2's system had the effect of minimizing the good results, and of doing an injustice to him.

The state of affairs outlined is by no means uncommon. More education is needed in these matters in order to give the mining industry a better place in the confidence of the investor.

Letters of a Self-Made Miner to His New Foreman.—II.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

My dear Tom:

Most mine managers seem to think that when they have hired a miner that is all there is to it; and they put him at work at any place in the mine where they wish work done. That is not my way of doings things. I wish you to make a study of your men and to place them where they will work to best advantage. There is no man who cannot do some things better than he can others. If you have a man who is good at a drive, keep him at it. But don't put a good shaft man to making a raise, nor a man whose forte is putting in uppers to sinking a winze.

You should know every man on the force who has had experience in blacksmithing, timbering, etc.; so, in case of the illness or the absence of the regular man you will know whom to put in his place. And when you take a man from his regular work and put him at something for which a higher wage is paid, see that he is credited accordingly, even though his work is far from satisfactory.

You should know every left-handed man, every double-hand man, every man who can strike right and left double-handed, every machine man, every man who is skilled in any one particular thing, so, in case you may have need for just such a person you can call him aside instantly, instead of having to make a hunt for the man when time may be precious.

I have had men who were utterly miserable if they were compelled to work off in an isolated locality all by themselves. Some foremen would keep a man in such a place just to show that they were boss. Don't do it. Humor the peculiarities and idiosyncracies of your men, not at their request, but before they ask it; not wholly because they wish it, but because it is to your interest to have them work where they will be happy.

You will have some men who will be splendid workers, but untidy. If such men mucked out after themselves they would leave windrows of broken ground on the floor behind them. Put such men at work where the vein is narrow and it is important to keep the ore separate from the waste, and they would not only be uncomfortable, but would often wonder which was the ore and which the waste. Keep such men either on development work, or in a stope where the vein is wide, and where it will be impossible for valuable ore to get mixed with the waste. On the narrow vein put a man whom you know to have good order, and who exercises his saving faculties. Such a man will take pleasure in making a clean separation, and every ounce of rich ore will be too precious to him to find a place in the waste.

I put a new man at work one time in a large stope where the hanging wall was very firm and we used few timbers. I was soon aware that he was exceedingly uncomfortable. He was continually apprehensive that the roof was going to cave in on him. He was intelligent, and I endeavored to allay his fears; but I could see, after a few days, that unless I changed his location I was likely to lose him, for he was apt at any time to be carried away by an irresistible panic. I took him out and put him at work driving through loose ground where several men had refused to work, where, even with the best men I could get, the ground would make runs on us, and we would be at great expense catching it up and getting under way again. In this place my new man was in his element. Frightened half to death in a safe place, he was perfectly happy doing the most dangerous work in the mine. No imaginary dangers oppressed his mind here. He was face to face with one he could see, and he knew he had intellect enough to avert it. He had so much caution that he never once let a run get started, and he braced his timbers so solidly as he went along that no one of them could have been moved a quarter of an inch.

I do not mention these things as examples of what you are to do under similar circumstances, for I recognize that conditions in this world are seldom, if ever, twice the same; neither do I seek to give you the impression that I am a very smart man, for no one knows better than I that I could not successfully pass an ordinary high-school examination, but I wish to emphasize the fact that to make a successful foreman you must understand your men. It is not enough that you take each man's estimate of himself. You should know from your own observations just what each man can do to best advantage.

A good wheel-horse will settle back on his haunches and let himself be dragged to the bottom of a hill before he would let the load get beyond his control. A good lead-horse, when not pulling, will walk along and step lively at times just so the singletree will not strike at his heels. We would call a man a fool who would put his wheel-horses on the lead and the leaders on the wheel. There is just as much difference in men as in horses, whether most persons recognize it or not; and I shall expect you to know your men and to place them intelligently.

Sincerely yours,

TIMOTHY STRONG.

ELECTRIC SMELTING BONUS.—The Government of the Dominion of Canada has granted a bonus on all ore smelted by electricity. The decision is the outcome of what are said to have been successful experiments made at the Sault, under the supervision of the Government. The bounties are as follows: On pig iron manufactured from Canadian ore by the process of electric smelting, during the calendar years: 1909, $2.10 per ton; 1910, $2.10 per ton; 1911, $1.70 per ton; 1912, 90 cents per ton. On steel ingots manufactured by electric process direct from Canadian ore and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity, from Canadian ore, during the calendar years: 1909, $1.65 per ton; 1910, $1.65 per ton; 1911, $1.05 per ton; 1912, 60 cents per ton.

On the Rand.

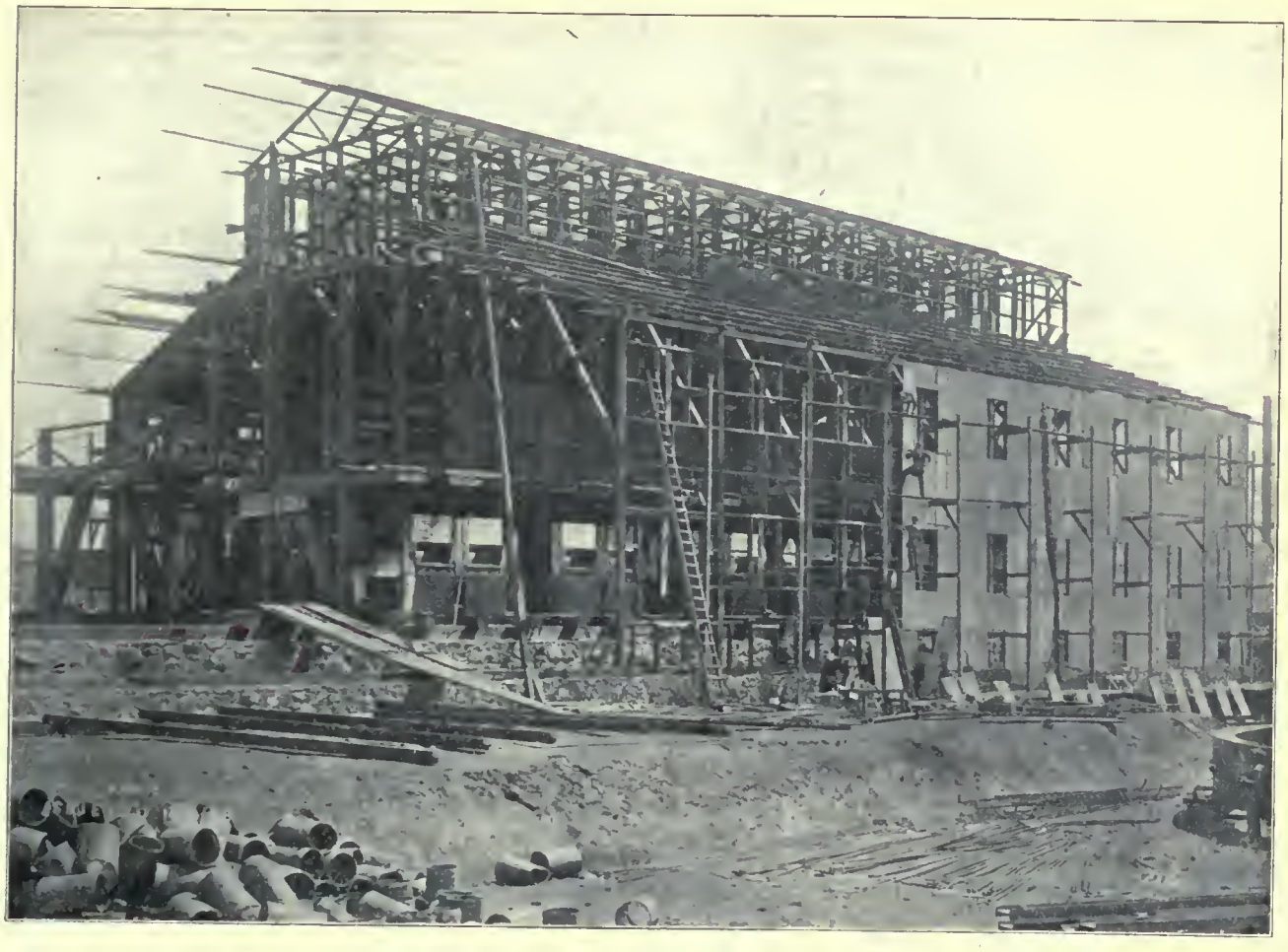
The accompanying photographs from Johannesburg were given to us by Mr. J. B. Pitchford, who kindly added the following notes:

Fig. 1 shows a 400-stamp mill in course of construction in 1898 for the Simmer East and Knights Deep mines. In this design vertical-compound mill-engines are placed in the middle of the building, driving 200 stamps on each side. The mill framing is of Oregon pine. The sides and roofing are No. 24 corrugated galvanized iron, which is extensively used on South African mine buildings and affords better protection against the spread of fire than boarding. This mill is now running and the portion equipped with tube-mills crushes nearly eight tons per stamp. The water used is about 7½ tons per ton of ore. The coal used in large mills amounts to 50 to 60 lb. per ton of ore crushed. This mill, with the cyanide and slime plant, sorting-house, precipitation-house, and refineries, cost about $2,500,000.

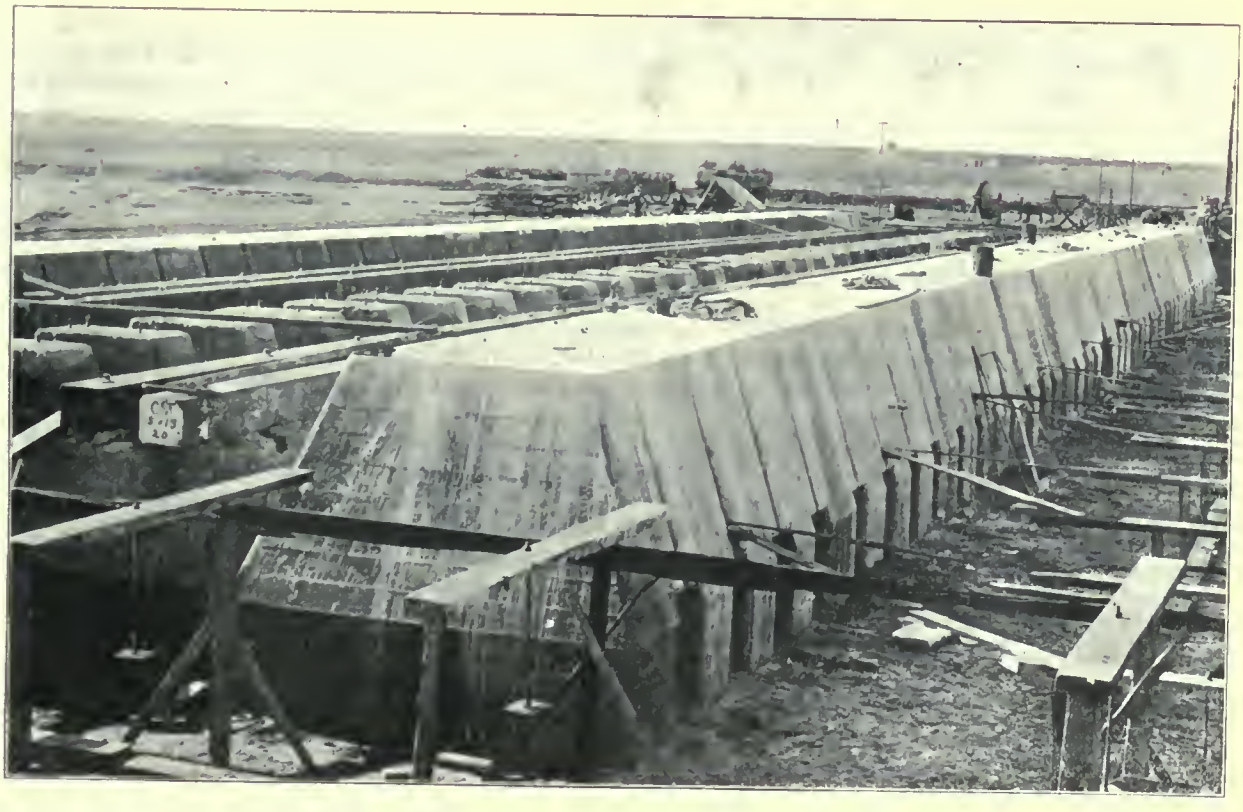
Fig. 2 illustrates the foundations for the battery, ore-bins, and battery line-shafts of a 220-stamp mill erected on the Cason mine, on the East Rand. This is a back-to-back battery with an electric motor at the outer ends of the line-shafts, which drive 110 stamps each. The concrete work costs $13 to $14 per cubic yard finished. The cement cost $7.70 per bbl.; labor was $4.36 per yd., and boxes, 75 cents per yard.

There being a small amount of slope to the ground at Johannesburg, tailing-wheels are used to elevate the battery-sand in order to distribute it to the cyanide vats. A few mines use plunger-pumps. Two or three mines use the Pohle air-lift, but 90% use tailing-wheels. They vary at different mines from 25 to 60 ft. in diameter. Some are built with wooden arms, some with channel-shaped steel arms, and others on the bicycle principle, with steel arms in tension. The wheels having sheet-steel rims usually have the buckets made of wood, as it stands the action of the sand better than steel or iron, and the worn parts can be readily renewed. The bicycle

Tailing Wheel, Made of Steel.



Stamp-Mill in Course of Construction. Simmer & Jack East.



Foundations for Battery, Ore-Bins, and Line-Shaft. Cason Mill.

wheel illustrated in Fig. 3 is at the Robinson Deep mine. The following table will serve to illustrate the main features of three different wheels:

	Diameter of wheel	Diameter at tangent circle	Distance between buckets	Width of buckets	Depth of buckets	Effective lift	Effective lift	Rim speed per minute	Buckets.
	Ft.	Ft.	In.	In.	In.	Ft.	%	Ft.	
Knights Deep & Simmer East	60	47	8	17	12	52	86	490	Double.
Robinson Randfontein	58	46	12	21	12	47	81	455	Single.
Robinson G. M	46	35	12	15	12	36	80	578	Single.

TURKISH SALT PRODUCTION.—The total average annual production of salt in the vilayet of Smyrna is 167,640,000 lb., the net cost of the product being 5.04 cents per 212 lb. The consul thus describes the industry: At Teham-Alti a certain kind of salt is collected from sea water, which is very much sought after by the Turks. It bears the name of *keupuk touzou*, which means 'froth salt.' It is collected from the salt pans when the crystallization on the surface of the water is just beginning, when the surface ruffled by the wind, which blows intermittently, becomes all froth. In order to secure a large quantity it is essential to collect it promptly and at an opportune time, otherwise it readily mixes again with the ordinary salt when this begins to form. The Turkish administration of the public debt has built four large depots at Phocia, which will store 94,600,000 lb. of salt. These depots are situated at about 20 nautical miles from this port. Large quantities of salt are shipped to the various ports of the Mediterranean in sailing vessels. Even with these large shipments the production still exceeds the demand and attempts are now being made to supply even Australia with salt from Turkey.

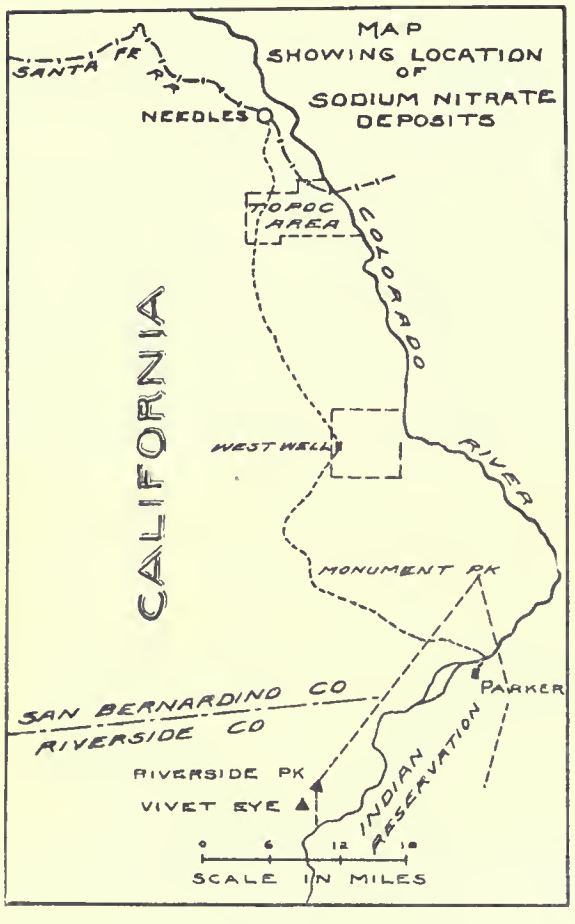


Fig. 1.

The Sodium Nitrate Deposits of the Colorado.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. TURNER.

In the summer of 1904, I had occasion to investigate certain deposits of sodium nitrate along the Colorado river, south of the Needles. Much interest in these deposits was aroused, and several square miles of land were located. The sodium nitrate deposits of the Death Valley region had been much advertised and their value exaggerated, so the discovery of similar deposits further south naturally attracted prospectors.

In the examination, I was assisted by J. H. Hartley. Many qualitative tests were made in the field, but the quantitative analyses were made by J. W. Howson, as well as by Harry East Miller. The district surveyed extended from the point where the Santa Fe railroad crosses the Colorado in San Bernardino county south to a peak locally known as Vivet Eye, in Riverside county. Subsequently J. H. Hartley went down the Colorado river from Needles to Yuma on a flat boat and found indications of sodium nitrate at other points farther south.

The region is extremely desolate, and in the summer, so warm that we preferred traveling as much as possible by night. The larger part of the area is occupied by the usual slopes of detritus, sparsely covered with spiny vegetation, with large tracts of soft lake-beds and of volcanic rock, chiefly tuff and breccia. Rising above these formations are higher ridges composed usually of older rocks, granite, schist, and limestone. The evidence goes to show that the volcanic formations are older than the lake-beds, as the latter rest unconformably on them. The lake-beds are made up chiefly of soft shale, usually lying in nearly horizontal beds. These are probably of fresh-water origin and perhaps belong to the same Pleistocene time as the famous Lahontan beds of Nevada. At one point, however, evidence of a still older series of lake deposits was noted near West Well in San Bernardino county.

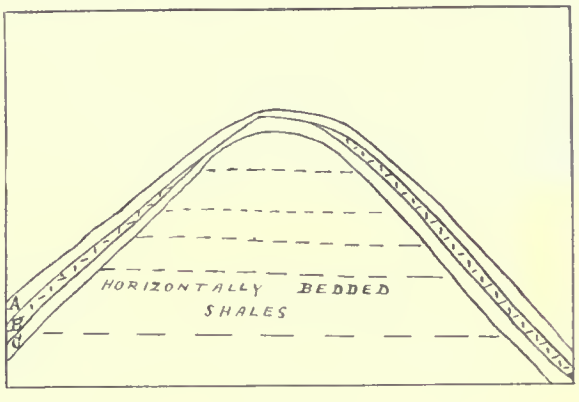


Fig. 2.

Special examinations for nitrates were made at four localities, as shown on the map (Fig. 1), namely: Topoc, West Well, certain hills composed of lake-beds at the south border of the Colorado River Indian reservation in Arizona, and the Vivet Eye area.

The nitrates were found in three forms: As an efflorescence chiefly on porous volcanic breccias, in the shales of the lake-beds, and deposits on the hill-slopes associated with the other salts and travertine.

In protected places on volcanic rocks, patches of white salts were found to contain sodium nitrate up to 1.5%, with much sodium chloride. It required but a few blasts, however, to demonstrate that the deposits were a mere surface efflorescence, as a foot or two below, the rock contained only traces.

Thus at one spot we found sodium nitrate:

	Per cent
At the surface	1.54
Two feet below the surface	0.16
Two and a half feet below the surface	0.19

The chlorides and nitrates of sodium on these volcanic rocks, both in the Topoc area and near West Well, appear thus to owe their origin to moisture impregnated with these salts being sucked up by the heat; on evaporating, the saline material is left as a white coating on the rock. Such salts are very soluble in water, and it is only in protected places that they accumulate. The salts were probably primarily derived from the lake shales, which are adjacent.

In the Topoc area, near West Wall, south of Parker in Arizona, and at many other points, there are extensive layers of a greenish shale in the lake-beds, and these shales nearly always give a reaction for sodium nitrate. These beds are much cut up by gulches and the surface is usually crusted over by a mud formed by the slacking of the shale during rains. This crust (*A*) usually gives a reaction for nitrates and other salts, but, immediately under it, there is frequently a white layer (*B*) richer in soda and lime salts. Frequently layer *B* is wanting. Finally, resting on the undisturbed shale is a third layer

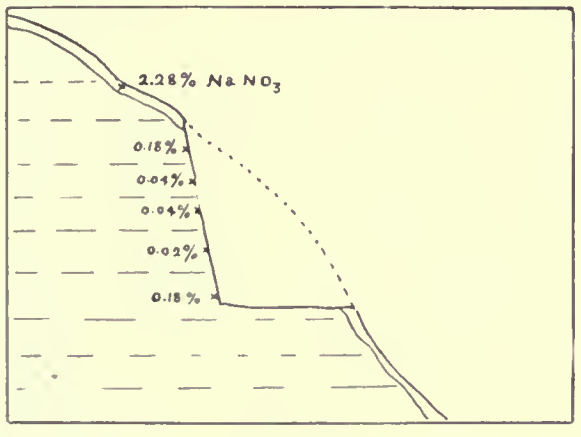


Fig. 3.

(*C*) from 3 to 12 in. thick, composed of broken bits of shale, and this lower layer usually shows a strong reaction for sodium nitrate.

Fig. 2 illustrates three layers, conforming to the general slope of which they form a part.

If now we cut through these surface deposits into the undisturbed underlying shale, we find usually a sudden decrease in the content of salts, and conclude that the larger content of salts in the surface layers is due to leaching by the rain-water from the shale, which breaks and slacks when wet. These salts are then re-deposited immediately under the mud crust in layers *B* and *C*, as shown in Fig. 2.

The decrease in the sodium nitrate content is illustrated in Fig. 3.

In the Topoc area, the shale showed a larger content of sodium nitrate than at the other points, as indicated by the following analyses by James W. Howson:

Number.	Per cent Sodium Nitrate.
1	1.90
2	3.23
3	0.76
4	4.08
10	3.80
11	2.19
12	1.14

In the deposits south of Parker on the Arizona side of the river, three different layers (Fig. 4) of greenish shale gave reactions for sodium nitrate, but the lowest layer was richest (1.96%) in this salt and this layer was reddish in color.

Finding no deposits of any commercial value in the volcanic and shale series, we proceeded south to Vivet Eye, where material of a better grade was promised.

Riverside Peak lies at the west border of the Colorado River Indian reservation. About a mile to the southwest and forming part of the same general ridge, is a peak locally known as Vivet Eye. In ascending this peak from the Colorado river, one passes first over limestone and dolomite beds probably of Paleozoic age; next over a series of green schists; then comes the limestone that forms the summit of Vivet Eye. These three terranes have a general north-south strike and dip at a steep angle.

The zone of green schist is largely obscured by fragments of schist that have been cemented by a porous deposit of carbonate of lime resembling travertine, mixed with varying amounts of white salts. This cemented material, evidently of recent origin, is sometimes 20 ft. or more in thickness. The travertine evidently owes its origin to the action of surface waters on the adjacent limestone, and the salts were presumably derived from former lake-beds now largely eroded by capillary attraction acting during a long space of time; waters impregnated with salts drawn from below, and evaporating re-

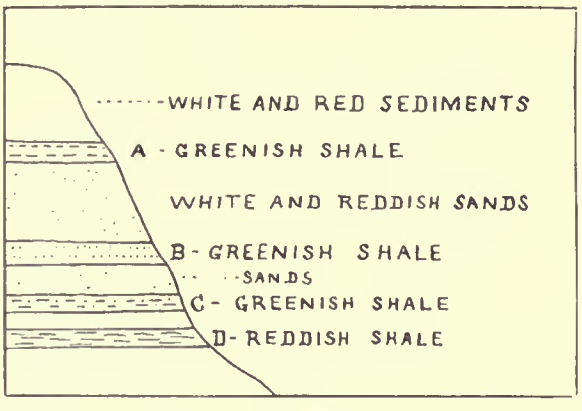


Fig. 4.

main at the surface, impregnating the porous breccia-mass of schist fragments and travertine. This deposit would thus be similar in origin to the efflorescence deposits of the volcanic rocks, but the conditions at Vivet Eye being more favorable, a greater accumulation of the salts has taken place.

A number of cuts were made in the cement-breccia of Vivet Eye, and here also the content of sodium nitrate was found rapidly to diminish with depth. At some points, however, nearly pure deposits of white salts a foot or more thick, were observed, and subsequent analyses showed several salts were present, including sodium sulphate, sodium chloride, calcium chloride, magnesium sulphate, potassium sulphate, potassium nitrate, and sodium nitrate. In one sample, 7.8% sodium nitrate was found, and in another 14.4%. The total acreage of the Vivet Eye nitrate deposits may equal 10 square miles or more, and this was the most promising of all the deposits seen. Nothing at all comparable to the Chile deposits was anywhere observed, nor is it to be expected.

The Chile deposits that are most profitable appear to have been formed by surface waters from the Andes percolating down to the plains between the Andes and the Coast range, and depositing there their salt contents. In the plains there is no rain and no run off, and hence the salts once deposited are preserved. In the Colorado basin, there are occasional rains, and the lake-beds drain into the Colorado river, which probably yearly *decreases* the total quantity of nitrates and other soluble salts in the basin.

The Murray Gold Belt, Idaho.

Written for the MINING AND SCIENTIFIC PRESS
By THEO. L. LAMMERS.

Murray, in Shoshone county, Idaho, is, I believe, the oldest camp in the Cœur d'Alene, and it was formerly wholly devoted to gold mining. There are today several lead-silver mines in the vicinity, but these are all later locations and east of the gold belt. In several of the gulches southwest of Murray, between Murray and Wallace, there are a number of gold veins. In the vicinity of Osborne, on the Oregon Railroad & Navigation Co.'s line between Wallace and Wardner, the same formation with the same gold-bearing veins is found, also with a number of old locations. I had the opportunity recently of examining these veins at different places; and it appears to me that a large sheet of gold-bearing quartz extends from a little northeast of Murray to some distance southwest of Osborne; thus extending in a direction a little east of north for about 25 miles, with a width of probably 8 to 10 miles. To be sure, between Pony gulch and Osborne, a distance of about 12 miles, I have not examined the formations; in this territory there are no prospects or locations, as far as I know. But there is every reason to suppose that the formation extends unbroken through this distance, although lying deeper. And if there are no gold prospects in this distance, neither are there any silver-lead prospects, which latter belong to a distinctly different and later formation.

As usual, the placer deposits were first worked before any attention was paid to the quartz veins. Around Murray and Delta a number of placers have been worked, and some of them have yielded well; in fact, there is still a good deal of placer mining on a small scale in the various gulches in this territory. All this gravel has undoubtedly originated from the quartz sheets. Murray was the largest camp in the district, and almost all the gravel washed here was found on the hillsides north of the gulch. The main gulch, through which Pritchard creek flows, is one large gravel bed, generally of rather low value, and mainly near, or on, the bedrock; but in a few instances some richer pockets appear to have been worked by sinking and driving.

This main gulch would appear to have been created by a fault, with considerable throw, which I, however, have made no effort to determine; the south side of the gulch is steep, in places precipitous, and the gold-bearing quartz blankets crop out along the hillside at an elevation of about 500 ft. On the north side of the gulch, which is much less steep, the veins crop out 300 ft. above the creek.

I am speaking of a quartz sheet, but there are really two or three sheets with a vertical distance between them of from 30 to 50 ft. These sheets lie sometimes almost horizontal, sometimes with a dip a little south of west. I think the steepest dip observed at any place is about 45°. The underlying formation is a quartzite, in which lies one, possibly two, quartz sheets; on the quartzite lies another, and this is again covered by an old metamorphic schist. The quartz sheets are thus only visible where deeper gulches have been cut in the mountains either by faulting, or denudation, or both.

The formation, including the quartz deposits, has been extensively faulted. Frequent dikes of trachyte, a few feet thick, penetrate the country with a nearly vertical dip; these dikes, running about NW-SE, have all faulted the quartz sheets, causing steps of from one to five and six feet, ascending going west, descending toward the east. Some faults have been much bigger; thus in Pony gulch I observed a vein, about 15 ft. wide, with a strike of N 55° W, dip 82° northeast, which cuts through the quartz blankets, raising the easterly side nearly 300 ft. above the westerly. These trachyte dikes and veins, cutting and faulting the quartz sheets, apparently belong to the later vein formation, to which belong the great silver-lead bearing lodes of this district. Indeed, similar dikes occur, generally cutting through the silver-lead veins, although not faulting them, and, I think, almost invariably in the close vicinity of orebodies, a fact that points to these dikes as the ore-makers, or closely associated with the silver-lead ores.

As to the origin of these quartz sheets, I am not at all clear. Their large extent would seem to argue against any igneous nature, or as created by deposition in a fissure or by replacement. And in various places they certainly give the impression of being of sedimentary origin. I have seen quartz deposits in vein form in limestone, evidently by chemical replacement, where I have found what appeared to be the original fissure, nearly perpendicular, through which the mineral-bearing solutions probably ascended. But I have observed nothing of the kind in this case. On the other hand, in at least one place, in the Golden Chest mine at Murray, there is a comparatively rich ore-shoot, in which the gangue contains scheelite—a fact that suggests an igneous origin.

The mineralization of the quartz sheets consists principally of pyrite and arseno-pyrite, with free gold; there is only a little silver. Chalcopyrite and galena occur sparingly. The mineralization in the vertical vein on Pony gulch, mentioned as cutting and faulting the quartz sheets, is entirely different, for it consists, in the outcrop, of heavy iron and manganese oxides, containing gold and silver, and showing galena in depth.

Along Pritchard creek, close to Murray, and between Murray and Delta, a number of mines have been opened and worked on these quartz sheets. They have all been pocket mines, that is, they have been opened on some higher-grade body of ore, and the mining has been confined to the extraction of this ore, neglecting any further development; almost all of these mines are now considered as worked out. I believe there is only one of them in operation, namely, the Golden Chest mine. There is, however, some prospecting being done on several claims. One of these, the Pilot, caused excitement about a year ago by suddenly disclosing a very rich shoot or lens, with ore running several thousand dollars per ton. Owing to various business arrangements, no serious development followed upon this discovery.

Most of these old mines have been equipped with small stamp-mills and, I presume on account of high expenses, they have had to confine themselves to high-grade ore. The mining seems to have been confined to extracting this high-grade stuff, neglecting development work. But it is doubtful whether these mines really are worked out. The high-grade lenses, to be sure, have been extracted; but there is gold all through this quartz deposit, and while certainly parts of it are too poor to be mined profitably, still, where I have examined and sampled it, the deposit would seem capable of furnishing a large tonnage of pay-ore, of low grade. What might be considered pay-ore would, of course, vary according to the operating expenses. Some claims on this deposit could certainly be mined at a minimum expense.

The Golden Chest mine, the most developed property in the district, shows bodies of good ore, which will probably average from $10 to $12 per ton in gold; this does not include the high-grade material. Twenty-five samples from various openings on the upper quartz sheet in another locality, where the deposit lies nearly flat, gave me an average value of $8.90 per ton in gold; and three samples from higher-grade lenses gave an average of $64 per ton. At the same time, samples could be

taken from these same openings that yielded only one or two dollars per ton. Evidently, part of the deposit would thus be too low-grade to admit of profitable extraction; probably one-fifth or one-fourth. At the same time, workings might at any time open up bodies of high-grade ore. While the quartz everywhere contains some gold, the metal appears to be concentrated in zones or lenses. As far as I have been able to observe, there are no special signs or indications to show when and where this concentration may be found, nor to indicate the end or limit of it. While the trachyte dikes seem to have some connection with the orebodies in the silver-lead veins, in these quartz sheets they do not appear to have any connection or bearing on the value of the ore, as is only natural, seeing that the dikes are of a much later formation. I would say, however, that it would hardly be profitable to work this deposit only for the high-grade bodies which might be encountered, and that to work the deposit as a whole profitably, it would be necessary to have conditions fairly favorable to cheap mining, with such equipment and openings as to be able to extract a large tonnage.

About two miles west of Osborne, on the north side of the valley through which flows the south fork of the Cœur d'Alene river (the O. R. & N. railroad follows this river up to Wallace), is located the Evolution mine, one of the old gold locations. This mine is opened on the same quartz sheets, which here show the same character, the same mineralization, and are similarly cut and faulted by trachyte dikes. The mine has been worked only by 'fits and starts,' and has not, as far as I know, made any production worth mention. Opposite this mine, on the south side of the valley, I have seen the outcrops of two of these quartz sheets. They have been prospected a little, and opened by inclines 50 to 60 ft. deep. The deposit here also dips southwesterly at an angle of 15 to 20°; the sheets are also cut and faulted by narrow trachyte dikes, so that raises have been made from the inclines to catch the continuation of the deposit.

The mineralization of the quartz here is virtually the same as in the Murray district; but in one place I found more galena than it usually carries, getting about 30% lead in one sample. H. S. Auerbach, the manager of the Golden Chest mine, tells me, however, that in one of the ore-shoots in that mine he finds considerable galena.

The thickness of the upper sheet is here from five to six feet. This is probably a little more than the average thickness, which I should estimate at about four feet; I have seen it in places only one or two feet thick, swelling to eight or nine feet.

While my investigations of this deposit have not been detailed, it appeared to me to be of considerable interest, both geologically and from the point of view of the miner.

COAL MINING IN ENGLAND.—The almost unexampled high prices of coal in Great Britain since last autumn, caused by the great demand due to the general prosperity and the severe winter, have led to work upon disused collieries and the prospecting for and opening of new ones. At several points about Nottingham new borings are being made, but the greatest activity in the district is in Lincolnshire. That county has hitherto produced no coal worth mentioning, though a belief has long existed that coal underlay it, and a recent report of the Royal Commission on Coal Supplies confirmed the belief as a fact. In a dozen different places new shafts are being sunk in Lincolnshire, and in several cases coal has been reached. The borings are generally to the depth of 600 to 900 yd. Some grades of house coal have recently declined a shilling (24 cents) per ton to the consumer, in comparison with midwinter prices. But this change occurs every spring. Coals for raising steam are, on the contrary, firm in price, and predictions are heard that they will yet further advance, possibly as much as $1 per ton.

Immigration Bureaus.

A recent railroad accident in California, in which more than a score of Italian laborers were killed and many badly injured, developed a rather curious phase of the labor problem. It was remarked by many people that the laborers were from Eastern points, more than half having come from New York, and were on their way to a mine in this State, where their services had been engaged through one of the Eastern employment bureaus. While the alien labor laws prohibit the employment of foreigners or the promise of work, which amounts to the same thing, before the immigrants have landed, the immigration authorities take good care that our future citizens are well looked after when once they arrive. They take the trouble to see that those who are not welcomed by relatives or friends are put under the charge of men who make it their business to find work of suitable kind, so as to prevent them from becoming a public charge. Of course, these men do not perform this duty gratuitously, but it is a fact that in serving their own interests they manage to take good care of the many thousands who come to us each week unable to speak our language and who would otherwise be the prey of sharpers, who frequent the water-fronts of all the large seaports. The employment bureaus, as businesses conducted for this purpose are called, being in such close touch with the immigration commissioners, are frequently the means of ridding us of many undesirable foreigners, who have escaped from the crews of vessels without having been passed on by the proper authorities. Almost invariably such foreigners are detained and subsequently deported.

For a number of years many mines in the East have had laborers supplied to them by the employment bureaus, and have nothing but good to say of the system. The Delaware & Hudson, through the Southern Immigration Bureau of New York City, is among the large mine-owners that have benefited by the careful selection of men trained to pick out the foreigners best suited for various kinds of work. In the past two years these agencies have extended their field of work and they now send every month many hundreds of laborers to work in the mining camps of the West.

IN ITS simplest form, a caisson is an iron cylinder somewhat bell-shaped, open at its lower extremity and closed by sliding doors at its upper. Leading out of the upper part on one side is a chamber called an air-lock which is separated from the interior of the caisson by an iron door, and also from the outside by similar means. It is through this air-lock that the men enter and leave the caisson. Between the sliding doors at the upper part, or movable ceiling of the caisson, and the roof is a chamber or space known as the material lock, through which the buckets filled with soil are passed. When placed in position, the bell-shaped expansion of the caisson rests upon the bed of the river, and atmospheric air under pressure is pumped in. This by displacing the water enables the men to work in a pneumatic chamber wherein they are dependent for the air they breathe upon that delivered into the caisson by pipes from an engine, and as the surplus of air escapes by the bottom of the caisson ventilation is by this means effectively secured.

Treatment of Matte from the Cyanide Mill.

Written for the MINING AND SCIENTIFIC PRESS
By A. E. DRUCKER.

It may be of interest to some to know of a quick and complete way in which to extract the metals from a rich matte as obtained at a cyanide clean-up. It often happens that the yield from this source adds considerably to the month's bullion.

Sulphur, the matte-forming element, comes from the zinc sulphate ($ZnSO_4$) remaining with the precipitate after acid treatment. The amount of $ZnSO_4$ present will depend, of course, upon the number of water-washes used in the final acid treatment. The more the precipitate is washed, the less will be the matte formed on a gold button. I believe that in our case (treatment of concentrate) it is possible at times for extremely fine material to escape from the filters, to be carried in suspension to the zinc-boxes where it is bound to remain with the other precipitate. The amount, however, is exceedingly small. If such be the case after treatment with acid, ferrous sulphate ($FeSO_4$) will be contained in solution, while free sulphur separates out with the precipitate according to the reaction:

$$FeS_2 + H_2SO_4 = FeSO_4 + H_2S + S$$

There is a possibility then, unless a complete roast is given to the acid-treated precipitate, of sulphur being present as a matte-forming material upon melting the final precipitate. The amount of sulphur obtained from this source to form matte will in all probability be slight. Experiments now point to the fact that the amount of matte obtained on a gold button depends principally upon two things, namely, the completeness of the final water-washes after acid treatment and the extent to which the final roast has been carried (whether merely a drying of the precipitate or a complete roast).

The matte that I am treating contains zinc, lead, iron, gold, and silver. When using the zinc-lead couple for precipitation, the presence of lead in the matte, if the gold slime is acid-treated and then smelted in a graphite pot, is practically inevitable. Lead in the matte may also be due partly to the dissolving (by the cyanide solution) of lead salts from oxidized concentrate followed by the precipitation of lead on the zinc. It may originate from the lead acetate used in some solutions. There are two sources by which iron may enter the matte, either by iron pyrite collecting in the zinc-boxes and finally appearing in the acid-treated precipitate as $FeSO_4$, or by some iron scale gathered from the roasting-pan with the gold precipitate. Zinc seems to enter the matte in considerable amount, especially when the acid-treated slime contains some undissolved zinc or has been only partly roasted, so as to contain zinc sulphate.

I believe that a small amount of matte on a button is desirable, for the slag above will, as a general rule, assay less in silver, especially when the matte contains lead. No nitre is used by us to keep down the matte upon fusion of the slime in crucibles. Its damage to the pots amounts to more than the cost of treatment of the additional matte. Previously to using my present method of reduction, we certainly did not welcome the presence of any considerable amount of matte at a clean-up, since the old method of treating small quantities with nitre or scrap iron was slow and incomplete. It is not safe to allow any amount of this rich matte to accumulate (it assays about $20 per lb.) and for that reason the best plan is to treat it immediately at the end of the clean-up, melting the bullion with the gold buttons into bars.

Potassium cyanide acts as a powerful reducing and desulphurizing flux, and for this reason it was used for decomposing the matte. Our particular matte is unusually high-grade, assaying as much as $45,000 per ton. It contains zinc, lead, and iron as sulphides, besides the precious metals. At the monthly clean-up about 800 lb. precipitate is obtained, producing nearly 3,000 oz. bullion, and from the treatment of this we obtain from 30 to 40 lb. matte. The amount varies from month to month. The method of treatment for the matte is as follows:

The matte, borax, and cyanide are put separately through a small rock-breaker and crushed fine. Borax and cyanide are used as fluxes and are put with the matte into three No. 60 graphite pots in the following proportions and order: There are alternate layers of borax, matte, and cyanide throughout, until the pot is full, and finally covered with borax. The crucibles are now put into the furnace and a white heat maintained for two or three hours. As a rule, it takes a little over two hours with a good hot furnace. It can be seen when the action is complete, for the charge will subside and the bubbling cease. The action and burning of the sulphur will be violent at the end of the first hour. Also the slag will become quite thick when the action is complete, being removed with a skimmer; this is necessary before pouring the contents of the crucible into a conical mold. If an excess of cyanide be used, it will be found just above the gold button and can be broken off by a blow with a hammer. The matte will now be entirely decomposed, leaving only a light porous slag and the gold button.

This method shows an extraction of 85 to 94% of the total value of the original matte, depending upon the richness of the material treated.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A specimen of Schist was sent by J. F. S., of Crackerjack, California.

The rock sent by O. H. F. H., of Bodfish, Cal., is a Sillimanite Schist.

The black sand sent from Cedarville, Cal., is specular Hematite, with some Magnetite. It would have no value as a placer deposit.

O. B. A., of Tenabo, Nev., sends: No. 1, Calcite; No. 2, Dacite, stained with Copper; No. 3, banded Opal, stained with Copper; No. 4, Turquois; No. 5, Chlorite and Epidote; No. 6, Pyrite, Sphalerite, Quartz, and Stibnite.

The specimens marked P., Mina, Nev., are: No. 1, Slate; No. 2, Epidote; No. 3, Quartzite; No. 4, Quartz-Porphyry; No. 5, Sandstone, No. 6, Rhyolite; No. 7, weathered Andesite; No. 8, Andesite; No. 9, black Quartzite.

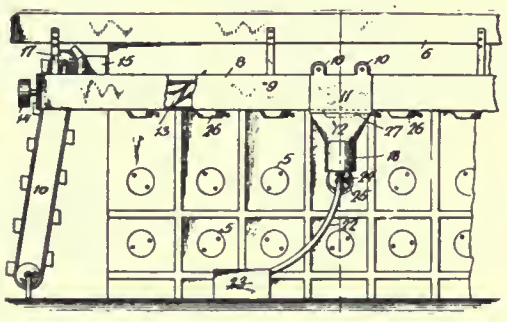
A. B., of Medical Springs, Colo., sends: No. 1, weathered Granite; No. 2, Epidote and Quartz stained with Limonite; No. 3, Diorite-Porphyry; No. 4, Feldspar-Porphyry; No. 5, Pegmatite-Granite; No. 6, crystalline Limestone.

B. R., of Hawthorne, Nev., sends: No. 1, Granite, with black speckled Hornblende; No. 2, Granite-Gneiss; No. 3, Barite and Quartz, stained with Malachite and Azurite; No. 4, Aplite Granite; No. 5, Chrysocolla; No. 6, altered Diorite; No. 7, impure Limestone.

MINING AND METALLURGICAL PATENTS.

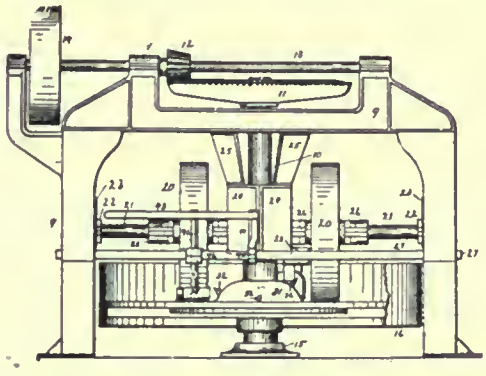
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PROCESS OF FILLING ZINC-RETORTS.— No. 851,668; John D. James, Pulaski, Virginia.



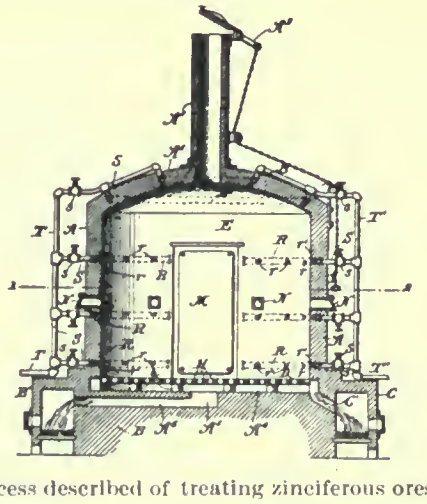
The process of packing or filling retorts, which comprises causing a jet of fluid to be directed into the retort longitudinally thereof, introducing into the said jet a constant supply of the material to be treated, said jet being of such force as to pack said material firmly and evenly within the whole cross section of said retort.

DRY-PAN CRUSHER.—No. 852,160; Jacob W. Boltz, Topeka, Kansas.



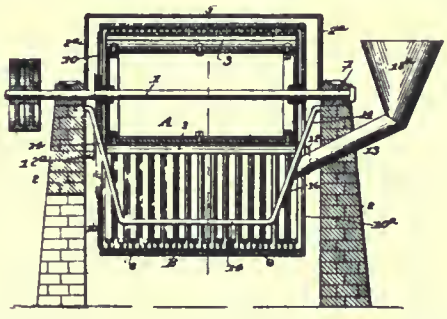
The combination of a frame, a vertical central shaft, a circular pan secured to the shaft and having an outer grated portion, a wearing-board, and a conical hub, mullers mounted loosely on the wearing-board to crush the clay, and plows to force the clay onto the wearing-board and under the mullers; with projections from the conical hub; and a toothed implement resting on the grated portion and diagonally disposed so as to push the larger lumps toward the wearing-board.

PROCESS OF PRODUCING ZINC SULPHATE DIRECTLY FROM THE ORE.—No. 851,639; George O. Angell, Philadelphia, Pennsylvania.



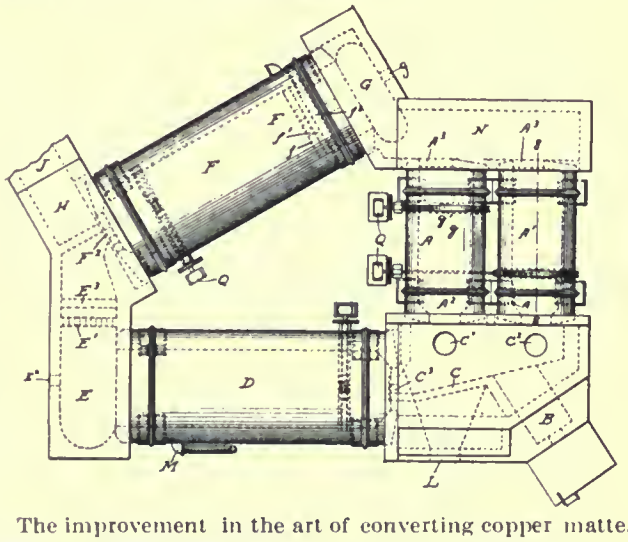
The process described of treating zinciferous ores containing sulphides of those metals, to convert and recover their constituent zinc and copper sulphides as soluble sulphates, direct from the ore, which consists in subjecting the ore, in a substantially closed chamber, to the action of burning sulphur oxides liberated, under the action of a preliminary roasting heat in the same chamber, from the constituent ore sulphides present, in the presence of free oxygen derived from air admitted to said chamber.

ORE-MILL.—No. 851,757; Julius Johnson, Mesa, Arizona.



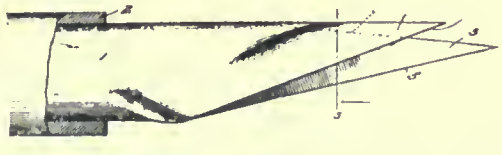
The improved ore-mill formed of a horizontal cylinder having its peripheral grinding portion formed of a series of bars extending transversely and parallel, and an inclosing drum resting, and its weight entirely supported upon, such cylinder, so that it constitutes the ore-crushing medium, said drum having its grinding surface formed of a series of bars extending circumferentially parallel and thus in planes perpendicular to the bars of the cylinder.

ART OF CONVERTING METALS.— No. 851,816; Richard L. Lloyd, Cananea, Mexico.



The improvement in the art of converting copper matte, which consists in feeding molten matte and flux into a converter, blowing the melt until copper sulphide is formed, removing the copper sulphide and adding matte until the slag becomes substantially neutral, removing the slag and feeding additional flux or slag unsatisfied as to bases, and so on continuously.

PICK FOR MINING OR CUTTING MACHINES.— No. 851,970; Thomas N. Wallace, Centerville, Iowa, assignor of fifteen one-hundredths to John R. Needham, Centerville, Iowa.



A pick for mining or cutting machines, comprising a stem, a central and side-points integral with said stem, the central point of greater length than said side-points, said side-points positioned in the same horizontal plane, the central-point positioned in a different horizontal plane from said side-points, said side and central-points provided with a longitudinally extending groove formed upon one side thereof, and upon their opposite sides said points taper to longitudinally extending cutting edges.

Publications Received.

NEW ZEALAND GEOLOGICAL SURVEY. 'The Geology of the Alexandra Sheet' in Central Otago. By James Park. This is an important bulletin by the director of the Otago School of Mines and deals with a large area of gold-bearing schist.

SOME RELATIONS OF PALEOGRAPHY TO ORE DEPOSITION IN THE MISSISSIPPI VALLEY, by H. Foster Bain. A reprint of a paper read at the Mexican meeting of the Tenth International Geological Congress. The Economic Geology Publishing Company.

THE DEPARTMENT OF COMMERCE AND LABOR, bureau of the census, has issued Bulletin No. 65, on 'Census of Manufactures, 1905; Coke,' preparad by Charles E. Munroe, under the direction of William M. Steuart, and which includes a map showing the situation of all coke plants in the United States, and descriptions of various processes of making coke.

Commercial Paragraphs.

HENRY F. JURS has severed his connection with the Power & Mining Machinery Co. to become local manager for the Mine & Smelter Supply Co., at Denver.

CLARK GROVE, who has been with the Mine & Smelter Supply Co. at Denver for a number of years, has been promoted to secretary of the company at 42 Broadway, New York, A. E. Loizeau, the former secretary, having been made auditor.

THE MORSE BROS. M. & S. Co., of Denver, report the following recent sales: A 100-ton concentrating plant for the Jessie Mines Co., at Chaparral, Arizona, in which will be installed three No. 3 Wild mills; F. W. Hearne & Co., Central City, Colo., one No. 3 Wild mill; the La Belle G. M. Co., Alma, Colo., complete 10-stamp mill with power; the Balkan Mining Co., Rochford, S. D., complete 5-stamp mill with power, and tables; and the Bear Top Mining Co., Murray, Idaho, one Franklin compound steam two-stage air-compressor, of 690 cu. ft. capacity.

MAX F. ABBÉ, inventor of the well kown Abbé tube-mill, sailed on April 30 on the steamer *Deutschland* for his regular annual trip abroad. Mr. Abbé will spend from five to six months in England and on the continent, and will visit London, Paris, Antwerp, and Berlin. The increasing popularity of the Abbé tube-mills has resulted in arrangements being made with Sutcliffe, Speakman & Co., of Leigh, Lancashire, to manufacture the various types, including the patented spiral feed and discharge tube-mill, for use in European countries, and Mr. Abbé will visit the works at Leigh while in England.

THE ABNER DOBLE COMPANY, engineers of San Francisci, have appointed Mitsui & Co. to act as their sole agents in Japan and its territories, Korea, China, and Manchuria, for the sale of Doble tangential water-wheels and hydraulic apparatus. The industrial development that is now taking place in the Orient, and the increasing demand for high-grade water-wheel machinery will make this co-operative arrangement an advantageous one for both parties. Mitsui & Co. is the largest and most progressive engineering house in the Far East and with its 35 branch offices is in a particularly good position to handle the water-wheel products of the Abner Doble Company.

THE INDIANAPOLIS SWITCH & FROG CO., of Springfield, Ohio, suffered from a fire on April 23, the main building of the machine shop being entirely destroyed, except the walls. This building was 400 by 225 ft., and will be rebuilt at once as a fire-proof structure. There was practically no loss of material or work in course of erection, and temporary arrangements are being made to complete, as far as possible, unfinished orders. At the earliest possible date this company will resume operations on a larger scale than before, restoring such equipment as was not seriously damaged, and replacing and adding such new machinery and facilities as are necessary for the equipment of a modern up-to-date plant.

THE JOHN A. TRAYLOR MACHINERY CO. has been awarded the contract for designing, furnishing all machinery for, and erecting a modern tungsten concentrating plant on the Rogers tract in Boulder county, Colorado, for Philip Bauer & Co., of New York and Hamburg. The ore will first be crushed on two No. 4 Traylor fine crushers to pass ¾-in. opening. The product between 30 mesh and ¾ in. will be jigged on the Traylor standard all-iron jigs. The tailing from these jigs will be re-ground on an Elspass triplex roll to pass 20 mesh. This product will be screened on five Imperial ore-screens, being successively treated on four Wilfley tables and two Traylor improved Frue vanners. The smaller product will first go to a Traylor slime-settling vat, and be drawn off to the two vanners. This plant will be in operation the latter part of June, sixty days from date of contract.

Catalogues Received.

A NEAT descriptive catalogue of the Ward Bros. Drill-Maker and Sharpener has been issued by the San Francisco office of the company. It contains a list of the companies using this machine, which includes many large producers.

THE DETROIT LEATHER SPECIALTY CO. Inc. of Detroit, Michigan, has issued a well gotten-up catalogue, devoted to the Wear Well leather packings, for hydraulic and compressed air, and all other machinery wherein leather packings are used.

THE COLORADO IRON WORKS CO., of Denver, Colorado, has published Catalogue No. 7-E, on 'Concentration Mills and Machinery.' This is an attractive catalogue of 100 pages, containing useful information regarding the treatment of ores by concentration.

THE FULTON IRON WORKS, of San Francisco, Cal., is just sending out a handsome catalogue, No. 106, of 94 pages, entitled 'Gold and Silver Milling.' The publication is beautifully illustrated with cuts of everything in the machinery line necessary for gold and silver milling, and amalgamating and concentrating.

THE KEYSTONE DRILLER CO., of Beaver Falls, Pa., has just published catalogue No. 2, describing the mineral-prospecting and placer-testing machines made by the firm. The publication is a large, beautifully illustrated folio, and contains some interesting information, including articles on prospecting and valuing dredging ground by wellknown dredger-men.

Trade Treatises.

THE ALLIS-CHALMERS CO., of Milwaukee, Wis., sends us Bulletin No. 1,421, describing the Overstrom table for concentrating ores, and detailing its list of advantages.

THE STEPHENS-ADAMSON MFG. CO. has issued pamphlet No. 2, 'Conveying and Transmission,' describing the belt-conveyors and elevating machinery made by this company.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, has issued a booklet, 'A Study in Graphite,' which gives in detail a series of tests of graphite made by Prof. W. F. M. Goss.

THE ROBINS CONVEYING BELT CO., of 13 Park Row, New York, has just issued an interesting four-page leaflet describing the installation of a package conveyor system in the new store of B. Altman & Co., Fifth Ave., New York.

THE INDESTRUCTIBLE FIBRE CO., Wendell & MacDuffie, 26 Cortlandt St., New York, sole selling agents, has just issued a four-page pamphlet describing their materials for car head-linings and marine work. There are three grades of fibre board made up in various qualities for this class of work, and are sold under the trade names of Durite, Fibrite, and Kantlite.

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Editorial.

WATER IN NEVADA has a value unknown in mining regions where gold is less plentiful. The article by Mr. Henry Thurtell, State Engineer of Nevada, gives a comprehensive account of the resources of the State in respect of water for agricultural and mining purposes. It is not on Wall Street alone that they turn water into golden wine.

BY THE WITHDRAWAL of the Spreckels steamers from service between San Francisco and Sydney, we have lost a useful commercial link with Australia. While the Oceanic Steamship Co. was never up-to-date, it was better than nothing; therefore we are glad to hear that a new line is likely to commence sailings in August. This new service will be operated under the name of the Australian Mail; Andrew Weir of London and Frank Waterhouse of Seattle are the responsible parties.

WE HAVE AVOIDED saying anything concerning the trouble between the dredging companies and the farmers, simply because any comment was calculated to aggravate the misunderstanding between two important local industries. It appears that the leaders of the Anti-Debris Association have shown a good deal of sense, and they have met with a reasonable spirit from the men directing the dredges at Oroville and Folsom. Every effort is being made to minimize injury due to mining operations, and the farmers are becoming aware that their interests are being properly considered. Therefore we expect to see matters adjusted without the litigation that would be so injurious to all concerned.

ROMANCE IN MINING is so often of a fictitious kind that a true story, with the element of the picturesque, is always welcome. The facts connected with the discovery of the famous Lluvia de Oro district, in Mexico, are related by Mr. R. H. Burrows on another page, and they would easily lend themselves to the skilled hand of such novelists as Mary Hallock Foote, Frank Nason, or Rolfe Bolderwood. Apart from this particular incident in the history of the district, Mr. Burrows gives a description of the ore deposits and their connection with the great fault that forms a magnificent scarp in the local topography. Even that extraordinary geological cleft might be made a feature in a romantic tale, beginning with the successful search of the heroic prospector and culminating in the plunge of the villain from the summit of that beetling cliff. The two main incidents might be filled out with a few *serapes* and *mantillas*, a description of an *arrastre* in operation, the repulse of a band of Yaqui Indians, a boom in the stock on Wall Street, a wild ride up the *arroyo* of Bahuerachic, and so forth. Here are materials for a novel to surpass

Tom Lawson's fervid rot as published recently under the title of 'Friday, the 13th.'

IT IS A PLEASURE to note the rapid growth of the business done by the United States Smelting, Mining & Refining Company, whose annual report has been issued recently. The properties are valued at $35,685,958, and the gross earnings for last year amounted to $15,149,574, giving a net balance for dividends of $3,504,522. We congratulate Mr. A. F. Holden and his associates, and trust that their operations will continue to be successful; for we take the position, frankly, that it is a good thing to have competition. The American Smelting & Refining Company, that is, the organization dominated by the Guggenheim family, is also doing well, and we hope it may continue to prosper. We pray that the mining industry may be delivered from the domination of any one company, however able or honorable. Healthy progress will be fostered by reasonable competition.

UNDER CONCENTRATES we publish replies to questions, in the belief that the problems confronting one man are likely to face another and that the effort to solve them will be of interest to many. Among other matters we are enabled, by the aid of advice given gratuitously by friends of this journal, to reply to matters beyond the knowledge of the editor. But it must be recognized that the privileges offered by the department known as 'Concentrates' must not be abused, that is, readers should abstain from asking for the advice that ought to be obtained from a professional man and paid for in the proper way. One condition of such inquiries we cannot accept, and that is the request that they be answered privately. Thus this week we get a letter from the propounder of a question asking that we refrain from publishing it, also to send him the answer privately. We decline to be used as a bureau of private professional advice. 'Concentrates' is a medium of presenting interesting information to an intelligent community, it is not private legal advisor 'in ordinary' to individuals in distress.

COMPLAINT IS OFTEN MADE over the delay in the publication of special reports by the United States Geological Survey. The results of geological investigation seem to be issued a preposterously long time after the field-work has been completed. The bulletin on the Down-Town district of Leadville is one of those long awaited by the mining community, in fact, the two houses of the last Colorado legislature passed a joint memorial asking the Director of the Survey to expedite the publication of this bulletin. Most people have but a scanty idea of the amount of labor involved in the correlation of data and the preparation of accurate maps, but even when all this is done there begins another stage, the protracted length of which is due mainly to those departmental methods symbolized by red tape. Under the law, everything in the way of maps and illustrations, except those of the folios, has to be submitted to competitive bidding before a contract can be let for engraving and printing. The Public Printer gives the engraving firms a number of weeks in which to prepare bids, and then, after the bids have been examined carefully, the successful bidder gets a further generous allowance of time wherein to complete the work. In the case of the Leadville bulletin, the text has been ready for several weeks and awaits the delivery of the engravings for illustration. If this last portion of the mechanical work were done by the Survey, as the folios are done, there would be a great saving of time and the expense would be no more, possibly less. It is hoped that the new director, Mr. George Otis Smith, a man of approved business ability, will be able to cut some of this red tape and expedite the issue of the valuable literature published by the Survey. We are informed that he has made special efforts to hasten the appearance of the Leadville bulletin mentioned above, and the Public Printer has assisted him by awarding the contract for the lithograph maps to the bidder specifying the shortest time limit, although his bid happened to be the highest submitted.

The Plight of the City.

CIVILIZATION is an orderly condition of living, based upon the organization of the community. At the present time San Francisco affords the spectacle of a complex civilization that has broken down by reason of the unwillingness of a portion of the community to observe the laws, written and unwritten, upon which social order is founded. With an indicted fiddler at the head of the municipality, with an industrial vendetta between the car company and its employees, headed on the one hand by callous financiers and on the other by irresponsible agitators, with a police force that gives its sympathy to one side and a public that suffers from both, we have so complete a collapse of the art of living in an orderly manner that the stranger within our gates would be warranted in asking if we are not tending to a condition of fixed disorder, that is, anarchy. For anarchy does not require cossacks and bomb-throwing, any more than it needs an imbecile czar and down-trodden serfs; anarchy is a chaotic condition of society, marked by the contempt for law and the absence of government. To that pass we have nearly come. And yet not quite. There are signs of an awakening, there is a leaven of good citizenship at work in this community, and there is evidence that out of the turbid stream of events there will crystallize a public opinion strong enough to support those who have civic spirit and are willing to translate that spirit into action. To the world at large San Francisco today stands dishonored by her municipal officers, corrupted by service corporations, and enfeebled by a puerile press. In an extreme measure she is the victim of forces created by an industrial civilization that is dominated by the universal haste to make money without regard to morality. The splendid energy of the individual and the wonderful resources of the region in which he lives, have served as yet mainly to turn the citizen into an island of selfish energy in the sea of circumstance; the pressure to go ahead is so great that the direction of progress is overlooked. San Fran-

cisco is the arena in which is being waged the great battle of a brutal industrialism against a restraining civilization, what is worst and what is best in human progress are here in vivid contrast, and if our city is the scene of a sordid drama, it is mainly because here the two extremes of modern advancement have been most developed. Nevertheless, we have no fear of the outcome, for we believe in the power of thoughtful men once aroused to their duty, and in the development, through experience, of popular government.

The San Francisco Smelter.

OUR READERS are aware, from the accounts we have published from time to time, that a large smelter is being built at San Bruno, on the outskirts of San Francisco. This plant is intended for the treatment of copper ores, and the silicious material incidental thereto. In our issue of April 20, 1907, and in that of April 14, 1906, we gave such information as the mining community would be likely to want on this subject. We welcomed the enterprise as one designed to be beneficial to this City and to the mining regions tributary to it. But it appears that there are those to whom a smelter is an anathema, to them it is a foul instrument of New York capitalists careless of our lovely scenery, and reckless of injury to our balmy air. It is not necessary for us to protest our freedom from bias of a common sort, for the MINING AND SCIENTIFIC PRESS is no more beholden to the Guggenheims than it is to the King of the Belgians, and we are as free to criticize the methods of the smelter consolidation as we are to discuss the origin of ore deposits. No more need be said on that score, and less might have been said save for the attacks made in the local press against this smelting establishment at San Bruno. Recently an article on the subject appeared in the Oakland *Tribune*, but the opinion of so disreputable a newspaper carried no weight, and it was not until the *Argonaut* entered the lists that it seemed worth while to contradict the fallacies of the untechnical press. We regret the attitude of our friend the *Argonaut*, for it is evident that it has been supplied with misleading data, and that it has unwittingly lent its character for honorable purpose to the furtherance of misunderstanding. In its issue of May 18 there appears an editorial entitled Another Menace.' This is full of errors. In the first place the capacity of the smelter is not 5,000 tons of copper ore per day, but 1,100 tons of charge, of which 700 tons will be copper ore. These ores "are said to contain" from 15 to 40 per cent of sulphur, and from a trace to 10 per cent arsenic. It is possible to learn just what they do contain, namely, the ore will contain 36 and the matte 20 per cent sulphur, and from nothing to 0.02 per cent arsenic. The supply of copper ore will be derived from the Dairy Farm mine in Placer county, the Trinity and Balaklala mines in Shasta county, while the silicious ore will come from Nevada.

The *Argonaut* states that the smelter will discharge 1,250,000,000 cubic feet of fume in 24 hours, estimated to contain 1,500 tons of sulphur dioxide, with possibly 20 tons of arsenic. These figures are likely to overwhelm a polo player at Burlingame, or a gentleman of leisure at San Mateo, but they are wildly incorrect. The smelter will discharge scarcely one-seventh the amount of fume stated, containing not 1,500 tons of sulphur dioxide, but 100, and not 20 tons of arsenic, but 100 pounds at the most. Of the total ore smelted in one day, 300 tons may contain some arsenic, the maximum total content being 1,000 pounds per day, not one-tenth of which will escape out of the stack, becoming deposited in the flues.

But there is another argument brought forward, namely, that it will be easier to deal with the matter now, than when the smelter people have vested rights on their side. The law is as faulty as the metallurgy. Smelting is not a nuisance *per se*, it is the manner of conducting it that may make it so; no company can get a vested right to operate a smelter in a manner injurious to the neighboring community unless that community permits the operation to continue for a term of years. To talk of stopping the construction of the smelter is false education of the public, for it is not legally possible. When the smelter is built, and when the fume from it is found to be injurious to life or property, then it will be possible to take legal measures for the purpose of ending the nuisance. In the meanwhile we may well leave it to the good sense of the community to decide whether such clever operators as the Guggenheims would invest two million dollars in a plant subject to immediate restraint; is it not reasonable to suppose (as we have explained on a former occasion) that they have obtained the best metallurgical advice with a view to doing no injury to the surrounding country? To non-technical people the percentages of sulphur, the cubic feet of fume, and the other scientific details do not mean much, but we venture to present one fact that requires no scientific training to be appreciated; and it is this, that New York is one of the most important metallurgical centres in the world. There are five large smelting plants in continuous operation within the outskirts of New York, and nearer to the heart of that city than San Bruno is to San Francisco or San Mateo. Most of these plants treat matte containing about 20 per cent of sulphur, and the injury is nil, simply because proper precautions have been taken. The trouble in Montana and Utah has been due either to the carelessness of the smelter people or blackmail from the ranchmen. If proper care is taken to prevent injury to life and property, and if the surrounding community is not rapacious, the smelters do their useful work without remark—as in New York, as at Tacoma, and as at Denver. For a large part of 15 years the present writer lived at Denver, within three or four miles of three large smelting plants, yet no one ever suffered, nor did the vegetation. A slight whiff of sulphur once in a while served as a reminder of an industry that benefited the whole community and was as necessary to the development of the resources of the country as the smoke of a locomotive or the whistle of a steamboat.

Personal.

J. H. MACKENZIE is in Arizona.

J. W. MERCER is in San Francisco.

JAMES D. HAGUE is here from New York.

ALBERT BURCH is at Lead City, South Dakota.

GEORGE W. MAYNARD is at White Horse, Alaska.

MARK R. LAMB is at Woods Hotel, in Mexico City.

DON MAGUIRE, of Ogden, Utah, was at Chicazo lately.

R. GILMAN BROWN has returned to London from Chile.

MARTIN J. HELLER is making a brief stay in San Francisco.

CLIFFORD G. DENNIS, of Terlingua, Texas, is on a visit to San Francisco.

WILLIAM R. FAITHFUL is on his way from London to southern Siberia.

GORDON LAND has left Oroville, and is now at Victoria, British Columbia.

H. S. MUNROE and JOHN J. ROBERTSON sail for Valparaiso on May 25.

E. H. NUTTER, superintendent of the Liberty Bell mill, waa in San Francisco this week.

ROBERT T. WHITE, of the Balaklala Copper Co., has been on a visit to Salt Lake City.

W. E. THORNE is now at East Auburn, Cal. He is field assistant to the State Mineralogist.

DAVID MCCLURE was in the City this week, on a visit from the Gwin mine, Calaveras county.

F. L. BOSQUI is at Tonopah, as consulting metallurgical engineer to the Montana-Tonopah Mining Company.

THOS. H. LEGGETT has returned to London from Russia. He expects to go there again before coming to California.

CHARLES JANIN, of Janin & Smith, is in western Chihuahua, Mexico. He expects to go from there to Denver.

F. S. SHEWELL, of Guanajuato, Mexico, was slightly injured in a wreck on the Burlington road near Chicago on May 9.

PERCY M. NEWHALL, engineer to the Witwatersrand Deep mine has returned from Johannesburg on a visit to Oakland, California.

GERALD LOVELL, lately manager of the Great Fingall mine, passed through San Francisco on his way from Australia to Denver, on a vacation.

C. M. FUELLER is engaged in professional work near Wickenburg, Ariz.; he will visit Los Angeles and San Francisco before returning to Denver.

ARTHUR W. JENKS passed through San Francisco last week on his way to Portland, Oregon, where he will open a permanent office at 242 Washington street.

LAZZARD KAHN of Hamilton, Ohio, has resigned as director of the Daly West Mining Co., and has been succeeded by HENRY G. MCMILLAN of Salt Lake City.

W. E. DEFTY has resigned as consulting engineer to the Mina Juarez Co., Sonora, Mexico, and has no further connection with the company in any capacity whatever.

A. A. HASSAN has left New York to examine the new discoveries at Larder lake and Lady Evelyn lake, near Cobalt, Ontario. From there he will go to Nevada City.

GEORGE SYDNEY BINCKLEY, late chief engineer and manager of construction for the Monterey Water Works & Sewer Co. and the Monterey Railway Light & Power Co. at Monterey, N. L., Mexico, has accepted the position of manager of the mining properties and smelter of the Douglas Copper Co. in the State of Sonora, Mexico.

W. Z. KINNEY, Silverton; A. G. BROWNLEE, Idaho Springs; R. L. MARTIN, Central City; GEORGE E. COLLINS, Denver; and T. J. DALZELL, Cripple Creek, compose the executive committee of the Colorado Mine Operators' Association, with permanent headquarters in the Boston Bdg., Denver. JUDGE E. A. COLBURN is president and W E. PASSMORE, secretary of the Association.

Latest Market Reports.

LOCAL METAL PRICES—May 23.

Antimony	26.25@29.25c	Quicksilver (flask)	$38@39.50
Copper	26.25@27.25c	Spelter	7.75@ 8.50c
Pig Lead	6.10@ 7.05c	Tin	43.25@44.75c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
May 17	24⅛	6	6⅜	65¾
" 18	24⅛	6	6⅜	65⅞
" 19	Sunday.	No market.		
" 20	23⅞	6	6⅜	65⅞
" 21	23⅞	6	6⅜	66⅛
" 22	23⅞	6	6⅜	66⅜
" 23	23⅞	6	6⅜	67

ANGLO-AMERICAN SHARES.

Cabled from London.

	May 16. £ s. d.	May 23. £ s. d.
Camp Bird	1 2 9 ex div.	1 2 6
El Oro	1 6 9	1 5 9
Esperanza	1 15 0	1 10 0
Dolores	1 11 3	1 12 6
Oroville Dredging	0 17 0	0 17 3
Stratton's Independence	0 3 6	0 3 3
Tomboy	1 18 6	1 18 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices May 16.	May 23.
Bingham Central	1¼	1¼
Boston Copper	29	25⅞
Calumet & Arizona	175	167
Cumberland Ely	9¼	8¼
Dolores	7½	7
El Rayo	6	5⅛
Guanajuato Con	4	4
Giroux Con	8¾	9⅛
Greene Con	23½	22½
Nevada Con	14¾	13¼
Nipissing	12¼	11⅜
Tennessee Copper	37¼	37
Tonopah Ex	2⅞	1¾
Tonopah-Belmont	4⅜	3¾
Tonopah	17⅛	15⅝
United Copper	61⅜	58
Utah Copper	28¼	26½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, May 16.

Atlanta	$ 58	Laguna	1.15*
Belmont	3.45	Little Tonopah	3.00*
Columbia Mtn	50	Manhattan Con	55*
Combination Fraction	2.75	Midway	1.20
Daisy	1.07½	Mizpah Extension	30*
Fairview Eagle	60*	Mohawk	15.00*
Florence	4.05	Montana Tonopah	2.65
Gold Bar (Bullfrog)	64	Nevada Hills	4.40
Gold Bar (Goldfield)	55*	Red Top	3.50*
Goldfield Con	5.37½	Sandstorm	44
Goldfield of Nevada	1.25*	Silver Pick	52
Gold Kewanas	69	St. Ives	95
Great Bend	64	Tonopah Extension	2.00
Jim Butler	84	Tonopah of Nevada	16.00
Jumbo	3.00*	Tramp Con	51
Jumbo Extension	1.52½	West End	78

* Asked.

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. May 23.	Name of company.	Closing prices. May 23.
Adventure	2½	Mohawk	84
Ahmeek	90	Mont. C. & C.	3
Allouez	48	Nevada Con	13
Amalgamated	88½	North Butte	85
Arcadian	5⅞	Old Dominion	49
Atlantic	12	Osceola	135
Balaklala	8½	Parrot	21
Bingham Con	16½	Phœnix	1¼
Boston Con	26	Quincy	118
Butte Coalition	24⅞	Raven	1½
Calumet & Arizona	167	Rhode Island	5½
Calumet & Hecla	825	Santa Fe	2¾
Centennial	27	Shannon	18¼
Con. Mercur	40	Superior & Pittsburg	16⅜
Copper Range	79⅞	Tamarack	114
Daly-West	16	Trinity	20½
Franklin	15½	Troy-Man	1¾
Granby	130	United Copper com	57½
Greene-Cananea, ctf	14⅛	Utah Copper	60½
Isle Royal	16½	Victoria	7¼
Mass	5½	Winona	8
Michigan	12	Wolverine	151

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ARIZONA.

COCHISE COUNTY.

A strike of three feet of ore, averaging 14% copper, is reported from the property of the North Bisbee Dev. Co. This company owns 20 claims about three miles northwest of Bisbee. The shaft is down 25 ft., and a tunnel has been driven 240 ft. H. S. Jones is president and E. H. Clark treasurer.

GILA COUNTY.

Globe is a busy camp, and it is estimated that there are more than 4,000 men on the payroll there, which is more than there were employed in Bisbee before the strike. The Phelps-Dodge company alone employs 2,800 men, 2,200 being at the Old Dominion and 600 at the United Globe.

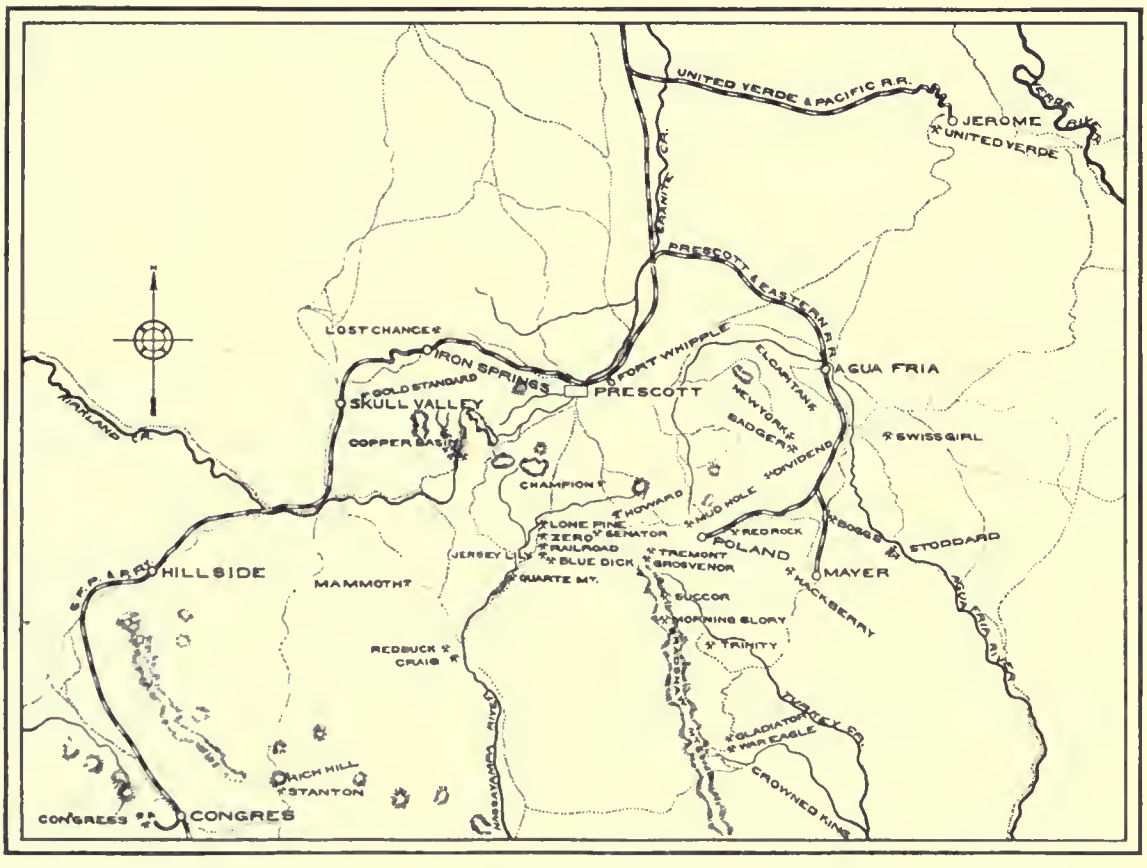
E. A. Wayne has resigned the superintendency of the Globe Consolidated company, and has gone to Silver City, New Mexico, to be manager of the Copper Gulf Development Co. His successor is Adolphus Baill, who was superintendent of the Utah Consolidated company.——A vein has been encountered in the north cross-cut from the Gem shaft of the Globe Con. property, about 300 ft. from the shaft.——The directors of the Old Dominion Mining Co. of New Jersey have voted to sell 12,000 shares of stock to shareholders, pro rata, at $50 per share. The Maine company owns all the stock of the New Jersey company, except about 6,000 shares. The stock will be underwritten without commission.

GRAHAM COUNTY.

The Lone Star Con. Co. has purchased the Iron King claim, adjoining the original Lone Star group. This company now owns 69 claims. A 50-ft. inclined shaft has been sunk on the Iron King, and copper sulphides have been encountered. The shaft on the Lone Star claim is down 330 ft. and is going down at the rate of 60 ft. per month.——A good vein has been opened in the San Juan claim, and at a depth of 245 ft. it is still widening.——The output of the Arizona Copper Co. for April was 1,316 tons of bessemer copper.——The output of the Shannon company for April was 627 tons of bessemer copper, a slight decrease from the preceding month. When the new railroad is built, this company will be in a position to handle more ore.

MOHAVE COUNTY.

Good results are reported in the cyanide mill of the Yucca Cyanide M. & M. Co. at Cedar. Lumber and machinery are being hauled to Victor, south of Goldroad.——A number of directors of the Benedictine mining company have recently visited the property at Cedar. Over 60 men are employed at the mine and mill.——The working force will be increased at the Techaticup and Wall Street mines, owned by Joseph Wharton, at Eldorado cañon.——John Boyle Jr., the manager of the Cerbat Mtn. property at Cerbat, reports that some rich ore has been struck in the winze from the 175-ft. level of the Vanderbilt mine. Connection is to be made through this winze with the 300-ft. level.——



Map of a Part of Arizona.

A. N. Rice, of Boston, has been examining the Planet mines. The diamond-drills proved valueless for prospecting and the property will be opened by a shaft. It is understood that a branch railroad will be constructed to the mines, along Bill Williams Fork, from the Arizona & California main line.

PINAL COUNTY.

(Special Correspondence).—The present smelter of the Saddle Mtn. Mining Co., at Christmas, consists of a furnace 36 by 122 in. with 11 ft. between floors. It will be raised to 18 ft. between floors, giving it a capacity of 300 tons per day instead of 200 tons, as now used. A new furnace will be added, 44 by 200 in., 18 ft. between floors, with a daily capacity of 500 tons, or a total for the plant of 800 tons per day. Both furnaces were built by the Colorado Iron Works. The new plant is ordered for this month's delivery, and there will be all the usual equipment of blowers, boilers, engines, dynamos, and electrical apparatus. The smelter is supplied by ore at the present time from three shafts, the Hackberry, 200 ft. deep; the No. 1, 400 ft. deep; and the No. 2, 200 ft. deep, besides the surface workings at Copper Knob and on Christmas hill, where a large tonnage is quarried. Part of the increased tonnage will come from two new shafts, the No. 3 and the Christmas, each of three compartments, 4 by 5 ft. in the clear. These two shafts will

eventually handle the greater part of the ore except from the Christmas and Copper Knob districts. The ore from No. 1 and 3 shafts will be handled as at present, by gravity trams, and from the Hackberry, Christmas, and No. 2, by electric trams. Good showings are found in the No. 1 shaft on the 120 and 300-ft. levels. The orebody on the 120-ft. level is a blanket formation. The ore is proved for a length of 625 ft. and 300 ft. wide and averages six feet thick. On the 300-ft. level a body of ore has been opened 225 ft. long and 94 ft. wide, which is stoped to the height of 22 ft., and a winze sunk 70 ft. is still in good ore. The percentages of copper are higher on the lower level. The ore is low-grade, but the showings on the 400-ft. level are good. The body on the 400-ft. level is about 5% copper, while that on the 120-ft. level averages not quite 4%. The smelting proposition of the company is unique. The ore is self-fluxing and not a pound of barren flux is used and no ore from other properties has ever been used. The smelter charge of ore at present carries 3% copper and can be brought up to 3½%. The company has produced about 3,750,000 lb. of copper to date and is producing with its present equipment about 250,000 lb. per month. Last month's payroll carried 586 names. In addition to the 535 acres which make up the patented copper property, the company also owns a gold property of 260 acres, five miles from Christmas, which is developed and patented. The company also owns 800 acres of coal land on which a beehive coke oven has just been built, to test the coking qualities of the coal. The fuel value of the coal has already been determined, as it has been used successfully under the boilers. On the coal property is one inclined shaft 175 ft. deep, which has opened up two veins of coal, one three feet and the other two and one-half feet thick.—— Word has been received from George B. Chittenden of the Saddle Mtn. Co., that Edward D. South will succeed him as general manager for the company.

Phœnix, May 13.

YAVAPAI COUNTY.

(Special Correspondence).—The new shaft at the Mount Union Con. Mining Co.'s mine, in the Mt. Union district, is down 700 ft., and a good body of sulphide ore is being opened in the lower levels. The mill is idle on account of the scarcity of coal, but will be started as soon as a consignment ordered some time ago is delivered.—— C. K. Tibbetts, general manager for the Golden Idol Mining Co., was in Prescott this week and deposited a bar of gold bullion from the company's mill in the Cherry Creek district. The gold bar was the result of the second run of the new mill.—— In Jerome there is a general awakening of the mining industry. Within the past month the force on the Octave mine had been increased to over 80 men, and preparations are being made to resume work on the Leviathan and the Rincon properties.

Phœnix, May 18.

A new reduction plant has been purchased by the Jessie Mines Co., operating in the Chaparral district. The mill will have a capacity of 100 tons per day, and will be equipped with amalgamating, concentrating, and cyaniding machinery. The mine is about four miles west of Huron, on the Bradshaw Mtn. railroad, and includes a water-right on the Agua Fria river. The Little Jessie mine is opened by a shaft 660 ft. deep, and more than a mile of drifts and cross-cuts have been driven on the vein. The shaft will be sunk to the 1,000-ft. level.

CALIFORNIA.

AMADOR COUNTY.

A feeling of unrest has been created about Jackson, by the request for recognition of the Miners' Union. The operators have made no direct reply to the demand, as they wish to know of the scope and effect of the recognition wanted.

CALAVERAS COUNTY.

The strike situation remains unchanged. The Utica officials declare that they will not listen to the miners' proposition, as do also the Lightner and Angels superintendents. The business of the town is paralyzed by the cutting off of a monthly payroll of $50,000.

NEVADA COUNTY.

The Republic mine, in the Graniteville district, has been bonded to Nevada speculators for $50,000. The vein is an extension of the National, and two tunnels have been run, the upper one being 830 ft. long and the lower 300 ft. A five-stamp mill is on the ground, and another mortar will be added.——The Mine Owners' Association has sent its reply to the Grass Valley miners' union, in the matter of an increase of wages, but what the text of the response was, has not been given out. It is generally believed, however, that the operators have refused to grant the raise of 50c. per day for underground men.——The new 10-stamp mill at the Conlan will not be in operation until June 1, the delay being caused by the non-arrival of the cams. The raise from the 300-ft. level has nearly holed through, and will be of great use in ventilating the mine.——The Pennsylvania company will soon have the two new pumps in operation, which will increase the pumping capacity 1,200 gal. per min. The pumps were made by the Taylor Foundry company, and are of the Cornish type, to be operated by electricity.——The Iron Mountain mine, in the Spenceville district, has been purchased by C. L. Wilson, of E. A. Wiltsee of New York. It is thought that he has merely taken over Wiltsee's option, which was for a long period of time. During the past year a shaft has been sunk for 150 ft. and two drifts have been run. Sinking has commenced again, under the superintendency of William Torpie.——Copper ore is being shipped to the Kennett smelter from the property of the Omaha & California Mining Co., at Spenceville.

PLACER COUNTY.

Six lessees are working at the Red Point.——The Imperial company needs more men.——The Pioneer quartz mine, between Towle and Damascus, has been sold.——There is rich ore in sight at the Three Queens.——L. C. Trent is directing operations at the Iron mine. The old shaft has been pumped out and cross-cutting has started, 14 men being employed. William Dodge is the superintendent.—— M. Savage is prospecting the old Homestake on the west side of Volcano cañon. Rich ore has been taken from this property, but the ground is very heavy and hard to hold.

The Crater Hill company, which has taken hold of the St. Patrick mine, near Ophir, has ordered a pumping plant. The Hammon dredging interests are backing operations at Crater Hill. The old workings, with a 700-ft. shaft, will be pumped out, retimbered, and equipped with modern machinery.

SHASTA COUNTY.

The steel frame for the Balaklala smelter at Coram is nearly finished, and Gerrick & Gerrick, the contractors, are shipping their machinery back to Seattle.

SIERRA COUNTY.

The tunnel at the Herkimer gravel mine is in 900 ft., and is nearing the old Bunker Hill channel, from which much gold was taken in the early days. A new ditch has been completed, which furnishes plenty of water for power and other purposes.——The gravel channel has been tapped at the Lucky Dog mine at Forest, now under bond to H. L. Johnson.——A rich pocket of ore, yielding $3,200 from 300 lb. of ore, was recently struck at the Tightner mine at Alleghany. This shoot of ore has been tapped at a depth of 170 feet.

Oregon mining men are investigating the mining situation at Forest, including the Nelly Bly gravel mine on Oregon creek, three miles west of Forest. The channel is supposed to be the one worked on Rock creek, at the City of Six and at the Ruby mine.——The Monte Cristo mine on American hill is being investigated. This mine is said to have paid $500,000 in the 6,000 ft. of channel that was worked, and the syndicate now negotiating for the ground will develop a part of the property never before worked.——A wagon-road is being built to the Sovereign mine in Ladies gulch, which is being developed by San Francisco capitalists. A 10-stamp mill, operated by water-power, will be built.

SISKIYOU COUNTY.

It is expected that the bond on the Blue Ledge mine will be taken up when due, on July 8. It is proposed to build a

road from Grants Pass to the Blue Ledge mine, over the Siskiyou Mtn., down Seiad creek, through Happy Camp, thence to Eureka.——There is a force of men working at the Highland mine, on Salmon Mtn., about 18 miles southwest of Etna. The vein is two feet thick and carries some rich pockets. L. H. Cory is superintendent.——The Portugese ditch and the Phillips ditch, carrying water to Hawkinsville, are still supplying water for the placer mines at Rocky Gulch and vicinity. The Phillips ditch furnishes a good head for hydraulic operations, while the Portugese ditch carries water for sluicing purposes.

Miners are scarce in the Callahans and South Fork districts. About 45 men are working at the McKean quartz mine and 15 men at the Welsh placer mine, on Grouse creek.——The Los Angeles company, working on the Lew Doggett ranch at Klamath river above Oak Bar, is putting up a French elevator, a new-style dredger. A steam-engine does the hoisting and the buckets are dumped into sluices, the tailing running back into the river.——Richard Reiss has struck a seven-foot vein near the wire bridge at Hornbrook. The tunnel is 175 ft. long and a shaft is being sunk to connect with it.——S. J. Fore has bought the Stalcup's claim on Klamath river, and the old mill at Ash Creek, which he will tear down and rebuild at Dutch Gulch.——The Salmon River H. G. & D. Co. expects to carry on extensive operations at Peterburg, near Cecilville, in the Salmon River district, this summer.——Several quartz veins have recently been found in the Yellow Butte district at the head of Shasta valley.

COLORADO.

GUNNISON COUNTY.

The Utah Fuel Co. has given S. Gruber a contract to supply 50,000 props to the Somerset mine.——The Crested Butte Coal Co. will increase its output as soon as the new pit cars arrive. The company now employs 40 men and the gravity train is in good working order.

OURAY COUNTY.

At the Gold Lions mine, at Red Mtn., much interest is being shown in a Park automatic loading machine, which has recently been installed by the Railway Materials Co., of Chicago. The machine is operated by electric motors, and loads material into cars direct from the pile. It has materially cut the cost of labor, and 10 cars, holding 40 cu. ft. each, have been loaded in nine minutes, including switching and other delays.

The Gold Lion tunnel, near Ironton, is in over 900 ft. For the last 700 ft. the ground has been soft, requiring close timbering. As soon as good ground is cut, a cross-cut will be started for the Mountain Lion vein.

SAN JUAN COUNTY.

With the opening of the Silverton Northern railroad from Eureka to Animas Forks, the Gold Prince mill, managed by W. Z. Kinney, will treat 500 tons per day. The Mountain Queen, in which a good body of ore has been opened, will start shipping, as will also the Sunlight and the Bagley tunnel.——The Silver Lake mill is running.——The Iowa-Tiger, which has lain idle for many years, will start shipping this summer.—— Copper ore is being stoped at the Detroit & Colorado mine, which is managed by L. L. Haines.—— The new electric transformer will soon be in place on the Tom Moore property, and the force of men will be increased. S. G. Martin is the manager.

SAN MIGUEL COUNTY.

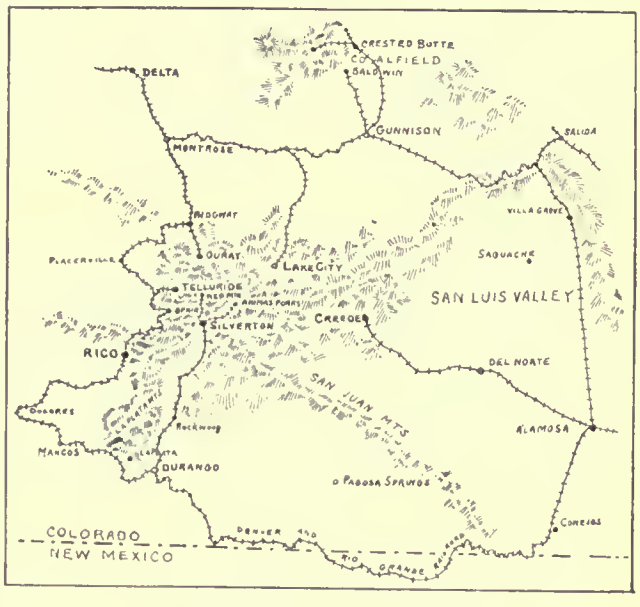
The Chicago men who recently purchased the Bradley and Pioneer mines, and the Cimarron group, in Marshall basin, are installing a new 250-h.p. electric motor to run a large air-compressor. The lower tunnel on the Bradley and Pioneer will be driven ahead, and development work will be done on the Cimarron. It is reported that the same people have an option on the Ophir tunnel, about 4,500 ft. long, which starts just above the Cimarron mine, and runs through the hill into Middle basin, intersecting the Montana vein.

SUMMIT COUNTY.

(Special Correspondence).—A deal has recently been consummated by G. Knutzen and associates of Berkeley, Cal., for the Eighty-six and Gold Dust properties, which comprise 120 acres on Nigger hill, about one mile from town. This property, especially the Gold Dust, has produced some high-grade material in the past, and is considered an excellent property. A large tonnage of mill dirt is reported in sight and it is the intention of the new owners to put the West Side mill, which they have secured, in first-class shape for handling the material from the mine. A three-compartment shaft will be sunk on the property and a hoisting engine suitable for the work will be installed. Most of the work has been done through an adit and winze, but the former owners did not have the capital to do the work necessary to make the mine pay. It is understood the parties now in control have plenty of money to put the mine on a paying basis.

Breckenridge, May 14.

(Special Correspondence).— Active operations proceed without cessation on the principal mines of this district, although this time of the year is bad for most of the properties, as the thaw is setting in, and the new snow falling at the same time causes a great flow of surface water. This is a great boon to the placer mining operations of the



Map of Southwestern Colorado.

camp, but is an endless source of trouble to the lode mining companies.—— The Germania property, on Little Mtn., is being worked by Adams & Adams, lessees, who are shipping high-grade silver-lead ore, carrying gold.—— The Cashier mine, which has produced well in the past and which has an equipment of modern milling machinery, is under consideration by Denver capitalists, who intend to merge with it the Three Kings property in the Swandyke district.—— The Sallie Barber mine, on Nigger hill, which produced some of the richest zinc ore in the county, has been unwatered preparatory to resuming sinking and driving on the veins. This mine will be one of the big producers this year.—— At the Wonderful London, the main shaft is down 570 ft., and the hoisting plant has been found inadequate to go down further. A new plant will be installed at once and the work of sinking continued. M. H. Howe is the superintendent.—— The Canyon Zinc Co. forfeited its contract on the Country Boy property by failure to pay royalties as agreed. The original owners of the Juniata Mining Co., of which the Country Boy is a part, have resumed control and will operate it themselves. This mine produces the highest grade zinc ore in Colorado.—— Mark G. Evans, of Denver, has obtained an option on the Washington mine, with right to operate it on royalty for a period of three years. By the agreement, work must be started on reconstruction of the mill by June 1.—— The Cornucopia Tunnel, M. & T. Co. is the name of a new incorporation registered by John C. Fry, N. M. Bass, and W. A. Blakiney for $2,000,000 to operate in Peru and Snake River districts.—— It has been decided to start a cross-cut

tunnel in French gulch, to be driven toward the main vein of the Helen group situated on Nigger hill. This property belongs to the Lennox Giddings Co., of Colorado Springs, and carries free-milling gold. If developments warrant it, a mill will be built on French creek.—— The main development tunnel of the French Creek mine is 3,000 ft. into Bald Mtn., and it is the intention of the owners to continue this work to cut the many veins which outcrop in that mountain.—— James T. Hogan, president of the Jessie Consolidated Mines Co., has returned from the East, where he made plans for the enlargement of the company's 40-stamp mill and plant. This is one of the most consistent producers in the district.——John G. Goodier announces that he intends to push work on the Abundance company's main tunnel, in Mineral hill.——The Swastika Gold M. Co. has made the final payment on the Minnie mine and mill. This company also owns the Lucky mine and mill adjoining the Minnie. Both properties are good producers and will be worked vigorously, and besides the shipments of high-grade ore that can be made from the properties, the large bodies of milling ore will be treated on the ground. This company will open an office in Breckenridge.——Fresh excitement has been caused by the finding of rich copper float in the Copper Flat vicinity, and assays have gone as high as 30% copper from surface rock.——Widmar & Dean, lessees of the Silver King mine on Nigger hill, have shipped two cars of galena ore.—— The lessees on the Dunkin property are shipping ore from the workings, which are reached by a tunnel running in from the railroad level.

Breckenridge, May 18.

SAN JUAN COUNTY.

(Special Correspondence).—Work in the San Juan district is opening up rapidly after the heavy snows of the winter. John Kemmerer, the manager of the Peerless San Juan Mining Co., situated in Minnie Gulch, at Silverton, recently placed an order with the John A. Traylor Machinery Co. for a 420-cu. ft. cross-compound belt-driven air-compressor, 75-h.p. A. C. motor; also Hardsocg Wonder air-hammer drills, and piston drills. The company has struck some good ore, and hand-work is too slow.

Denver, May 18.

IDAHO.

IDAHO COUNTY.

(Special Correspondence).—Specimens of ore from the Yellow Boy mine on the upper Snake river look well. The ore, which is silver-lead, with some gold, is found principally where the veins cut the quartzite formation. The owners have driven two tunnels. Tunnel No. 1 is in 150 ft., showing ore the full length, and at the face the vein is six feet wide. At the foot-wall side there is a streak of galena assaying 60% lead, and 30 oz. silver and $12 per ton in gold. Tunnel No. 2 is 100 ft. below tunnel No. 1 and is 300 ft. long. At the mouth of this tunnel a small amount of high-grade ore was encountered, and at a distance of about 325 ft. it is expected that the main body of ore will be encountered. On the dump the company has 50 tons of high-grade shipping ore running $90 per ton, while there are 500 tons of concentrating ore that runs from $5 to $20 per ton.——The Butte & Orogrande Mining Co. will spend some money in further developing the Hogan mine in the Buffalo Hump district, on which, last year, $50,000 was spent in experimental work. In 30 days active development will be commenced. Last year the glory-hole system was tried, but it is likely that some other system will be used on the Hogan hereafter.——The stamps of the South Fork mine in the Elk City district are now in operation, and the owner, E. E. Espey, expects to run them all the time. This mine is the one from which $1,480 was taken in 21 days during the last season.——In two months work on the upper American river, C. E. Svenson, a placer miner, has extracted $600. In three seasons of work, averaging only two months to the season, he has taken out something over $1,600.——The Golden Rule, on the upper American river, with the eight-mile ditch ready for use, is expected to be a big producer Last season the company operating the Golden Rule found it profitable to handle gravel of five cents per cubic yard, and it is believed that the gravel will run from 45 to 75c. per cu. yd. The new ditch will carry 700 miner's inches of water, so that 1,000 cu. yd. of dirt can be handled in 24 hours.

Lewiston, May 20.

The Big Baldy M. & M. Co.'s property on Crooked creek, 10 miles south of Buffalo Hump, is to be thoroughly exploited during the coming season. Development work has been going on for the past two years. The proposition consists of 22 claims, and 300 ft. of tunnel work has been done. Eleven veins have been explored and show gold and silver ranging as high as $60 per ton. A power-plant will be erected and the surplus power of from 500 to 700 h.p. will be carried to Buffalo Hump for the use of mining plants at the camp.——The Rubberneck mine at Lucile, on the Upper Salmon river, has been vigorously worked this winter. Henry U. Huber announces that a tunnel 270 ft. long has been run and will be extended 150 ft., where it is expected to cut the main vein. One vein 18 ft. wide was struck at a depth of 140 ft., which shows free gold on the foot-wall. Mr. Huber reports that I. Cleaver, superintendent of the McKinley group, has struck a five-foot vein of the richest ore yet seen in the McKinley mine.——The Blue Jacket, operated by the Northwest M. & M. Co., has nearly completed a 900-ft. tunnel with cross-cuts. The mine will be operated all summer. The Crook Corral mine, which has been unable to run for two years on account of water, has been opened. This mine is on the divide between the Salmon and the Snake, and with sufficient water to operate it, is a money maker.——E. A. Henchilwood of Elk City, has discovered a new placer ground of unusual richness, west of the American river bridge on the Orogrande road. The area of the ground is small, but prospecting has proved it to be wonderfully rich. The new placer is not far from the famous Grubstake placer, which played a prominent part in the history of the early days of the district.——George B. McCall of Chippewa Falls, Wis., announces in Spokane that $50,000 will be spent this summer on development work and new machinery for the Hogan mine, in the Orogrande district, in central Idaho. The plans are complete and they embrace the expenditure of nearly $500,000 on the mine, of which 10% will be spent this year. The Hogan mine is the property of the Crooked River M. & M. Co., the stock of which is to be exchanged for that of a new company, the Butte & Orogrande Mining Co., with a capital of $3,000,000. Articles of incorporation for the new company have been filed in Idaho.

KOOTENAI COUNTY.

The Boston group of claims, on Strong creek, six miles north of Hope, has been bonded by J. W. Messner, of Baker City, Ore., owner of the Buck Horn group, eight miles above Bonner's Ferry, for $86,000. The purchaser is to begin development work not later than June 15, and do not less than $2,500 worth of development work before September 1, at which time the first payment of 5% of the purchase price is to be paid. There are five parallel veins running through these claims, but most of the development work has been done on the Boston claim. On the surface this vein seems to be seven feet wide, but in a tunnel at a depth of 60 ft. the vein was 18 ft. wide. It is wholly a gold proposition. The Idaho claim above the Boston has had some development work done on it and a 100-ft. tunnel makes a showing similar to that of the Boston.——At a meeting of the stockholders of the Blue Bird Mining Co. the following trustees were elected for the ensuing year: W. S. McCrea, W. C. Ufford, Charles Theis, J. M. Jeannot, and F. E. Goodall. L. N. Baker was chosen secretary. The property is situated on Lake Pend d'Oreille. Considerable work has been done and a body of ore opened up that carries silver and copper. The work now being done is toward opening the stopes. It is understood that when the Panhandle smelter begins operations it will be prepared to treat the full output of the mine.

SHOSHONE COUNTY.

(Special Correspondence).—Ten per cent payment on the $150,000 bond of the Blackhorse mine in the Murray district of the Cœur d'Alene, owned by Charles Manley, was made by Patrick Burke, who holds the bond. This is the second

payment made by Burke on the property, the former one being made in January, for 10%. The balance is to be paid within a year. Mr. Burke plans to drive a long cross-cut to open the mine at a depth of 1,000 ft.——John A. Finch, of Spokane, has completed a transaction by which Al Page, of Wardner, has bonded the Nevada-Stewart mining property for $125,000. The property is on Pine creek and adjoins the Surprise mine. Three hundred feet of work has been done in the upper tunnel and 150 ft. in the lower, and some excellent ore has been opened. A large crew of men will be set to work in the mine.——Mr. Page has also taken an option on 100,000 shares of the Surprise mine at 16c. The property consists of four claims on the south side of Kellogg peak, 2½ miles south of Wardner and on Stewart creek. The development work consists of about 1,200 ft. of tunnels, 1,100 ft. of cross-cuts, and 110 ft. of driving on the vein. A good showing has been made, and six tons recently shipped show values in lead and zinc of $50 per ton. Mr. Page is to back the company for $25,000, to erect a concentrator. The work on this will be pushed just as quickly as the machinery can be moved, and the mine may be a shipper in 90 days.——A. D. Gritman, manager of the Charles Dickens Mining Co., states that they are doubling the capacity of the plant, but the machinery now being installed is the same as that already in the mill. The concentrates run 63% lead, 31 oz. silver, and less than 5% zinc. The mill was designed after a careful examination of the ore by Otto Trojenoski, of the Hecla mine. The mill will continue to run while this machinery is being put in place. As soon as they close satisfactory contracts with the smelters, shipments will begin.——Burton L. French, of Moscow, has received advices from the Department of the Interior at Washington, D. C., that while 310,000 acres of land in the Coeur d'Alene reservation, beginning 17 miles east of Spokane, will not be thrown open to settlement and entry this year, mineral entry may be made for any of the lands except those allotted to the Indians. It is added: "In interpreting this clause the office has held that the Act also applies to lands in the occupation of any Indian. All coal and oil deposits in or under the lands within the reservation remain the property of the United States, and the Secretary of the Interior is authorized to reserve such tracts for townsite purposes as in his opinion may be required for future public interests." Negotiations are pending for an option

The Coeur d'Alene, Idaho.

on the Nabob mine, near Wardner, by the lead trust. The mine has been under examination by experts for the company and it is understood that a verbal option has been obtained. D. F. Hallahan and associates own the controlling interests in the property, much of the stock being held in Butte. The company is incorporated for 1,000,000 shares, nearly all of which are outstanding. The Nabob has been opened to a depth of 400 ft. by a shaft, and a fine body of ore has been disclosed in the upper workings. Recently shipping ore was opened in the east and west drifts on the 200-ft. level. A carload of ore was recently shipped to the smelter.——A. B. Campbell, of Spokane, and capitalists of New York and Youngstown, Ohio, have closed a deal for 40,000 shares of the stock of the National Copper Co., operating in the Cœur d'Alene. The drift on the property has followed the vein nearly 300 ft., all in ore, much of which is of shipping grade. The ore runs high in silver, lead, and copper. Machinery, including a compressor-plant, a hoist, and pumps, will be moved to the mine at once. The Washington Water Power Co. will furnish the plant with electric power early in June. Charles McKinnis, of Wallace, is manager of the mine and F. Cushing Moore, consulting engineer.——The International M. & E. Co., which has recently acquired three groups of claims in the Cœur d'Alene district, has begun development work on a group on Pine creek, known as Group Eight. A contract has been let to sink a shaft 200 ft., and another contract awarded is for a 300-ft. tunnel. The contracts were secured by F. C. Fox, of Kingston.

Spokane, May 18.

NEVADA.

LANDER COUNTY.

(Special Correspondence).—Some strikes have been made in this district during the past week.——In the Two Widows mine, a shoot of ore was cut by a cross-cut from the bottom of the 100-ft. shaft. The vein carries gold, silver, and copper. The mine is being operated under a bond and lease by P. B. Loeher of Salt Lake.——The Truckee-Greyhound group has been purchased by Colorado and New Jersey parties for $30,000. This property lies between the Gold Quartz and Gem mines, and will be developed by a shaft.——The new hoist for the Gold Quartz has arrived.——Some ore has been encountered, and indications are good.——A strike is reported from the Bridal Wreath, samples of the ore running fairly high. Several men are employed.——The Lander, Phœnix, Gold Quartz, Little Gem, Standard, and Lovey mines are shipping ore, and the Ground Squirrel, Two Widows, Bridal Wreath, Black Rock, and two or three others may do so before long.

Lander, May 20.

LYON COUNTY.

(Special Correspondence).—This district is yielding some rich ore.——At the New Comstock they have just opened up another good vein.——At the Ramsey Comstock some good ore is being mined from a seven-foot vein that was only five inches wide on the surface; at the Bonanza, where a vein was found 85 ft. down, the company has opened up ore that runs well. All of the finds have been on contacts.——The Walkover contains many streaks of ore. H. H. Clark has a group of claims between the Walkover and Ramsey Comstock, and on his Ibex mine there are several showings of ore. Some claims have changed hands and this summer will see a good deal of activity in the district.——The old Garavanta mine is being opened.

Ramsey, May 18.

NYE COUNTY.

(Special Correspondence).—A vein has been uncovered in the 800-ft. level of the Midway, and it is regarded as an important discovery.——The 40-stamp mill of the Montana Tonopah will commence operations in about six weeks, and a big force of men will be put to work in the mine.——At the Tonopah of Nevada, the working force is being increased, and virgin country is being opened.——Operations at the Blue Light mine, at Mina, are steadily progressing and some good copper ore is blocked out. The shaft is down 250 ft. and has tapped a vein.

Tonopah, May 16

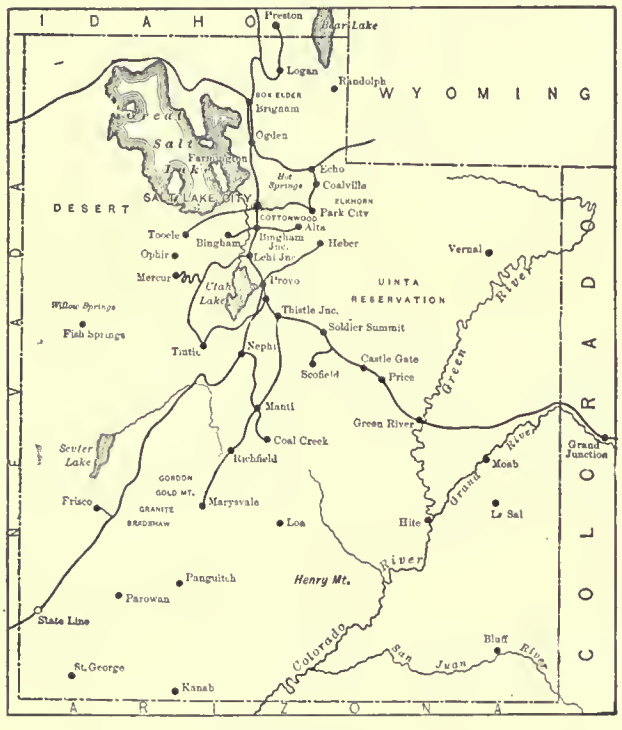
Special Correspondence.

Salt Lake, Utah.

Shipments From Park City. — Railroad Extensions. — Production of Tintic.—New Concentrators.—Consolidation of Mines.—Dividends.

The ore shipments from the Park City district last week amounted to 1,840 tons, the contributing mines and respective amounts being: Daly-Judge, 560; Silver King, 554; Daly-West, 550; Ontario, 176 tons.——For a consideration of $30,000, the Iowa Copper Mining Co. has added additional territory to its Park City property.

It is authoritatively stated that the San Pedro, Los Angeles & Salt Lake Railroad Co. will shortly undertake the construction of a branch line into the Deep Creek district in western Utah; that it is likely that the contract for the first section of the road will be let about the time of the completion of the Caliente & Pioche line, now



Utah.

being built from Caliente to Pioche, Nevada. Three camps have been established and the work of grading has begun on the Eureka railway, to connect the principal mines of the Tintic district with the plant of the Tintic Smelting Co., which is about to be erected for the treatment of lead-silver ores.

The ore shipments from the Tintic district last week amounted to 143 carloads, or approximately 6,000 tons, the contributing mines and respective amounts being: Ajax, 3; Beck Tunnel, 8; Black Jack, 1; Bullion Beck, 2; Carisa, 4; Centennial Eureka, 51; Colorado, 7; Dupue, 5; Eagle & Blue Bell, 5; Eureka Hill, 1; Gemini, 5; Grand Central, 3; La Clede, 1; Lower Mammoth, 8; May Day, 3; Mammoth, 12; Scranton, 6; Swansea, 1; Tintic Iron, 10; Uncle Sam, 3; Yankee Con., 4 carloads.

The management of the Albion mine at Alta has announced that regular ore shipments will be inaugurated about June 10. This company will probably build a mill during the present year for the treatment of its low-grade ores.

The Utah Apex Mining Co. has begun moving low-grade ore to the Markham Gulch mill at Bingham. The Apex company, according to a statement made recently by the management, has about 6,000 tons of such ore in storage and on the dumps. The first unit of the Utah Copper Co.'s new concentrating mill at Garfield is practically ready, and the management is hopeful of placing the plant in regular operation before June 10. The matter of adequate ore transportation facilities is still giving the Utah Copper management something to worry about. The Rio Grande Western Railroad Co. is short of motive power to handle its Bingham traffic.

Shareholders of the Ohio Copper Co. have been notified of a special meeting to be held in Lincoln, Neb., on May 30, at which time the matter of a $600,000 bond issue will come up for consideration, the proceeds to be applied toward meeting the cost of the concentrating mill, now under construction, and the further preparation of the mine for production upon a large scale.——The Honerine Mining Co., with properties at Stockton, will soon call on shareholders for an assessment, which will be applied to paying off the outstanding obligations of the corporation. The Talisman mine in Beaver county is producing regularly. In addition to the lead-silver ores, zinc will probably become an important source of revenue. A 6-ft. vein of zinc ore was recently cut. Zinc has also been found in the Burning Moscow mine, near-by.

The labor difficulties at the United States smelter at Bingham Junction are still unsettled and the plant has been practically out of commission for a week. The men made a demand for higher wages. ——The directors of the May Day and Uncle Sam Consolidated Mining companies in the Tintic district have agreed to a coalition of interests.

Dividends have been declared by the following Tintic companies during the month: Grand Central, $10,000; Beck Tunnel Con., $40,000; Colorado, $40,000; Lower Mammoth, $9,500; the last two named making their initial distributions. The Utah, of Fish Springs, will pay $3,000.——The Beck Tunnel Consolidated Mining Co. has decided to sink a new double-compartment shaft through which the property will be operated in the future. It is expected that it will encounter ore at about 300 ft. depth.——The Newhouse Mines & Smelters Corporation produced a little more than a million pounds of copper during the month of April.

Mexico City.

Esperanza Output.—Other News From El Oro.—The Balsas District.—Failure of a Smelter.—Reasons for It.—Santa Casilda Co.—The Coinage Law.—Its Operation and Success.—Strong Financial Position.

The Esperanza Mining Co., controlled jointly by the English company and the mining department of the American Smelting & Refining Co., in the camp of El Oro, Mexico, though still making an excellent showing, has had its profits reduced of late by a decrease in the grade of the ore, which formerly was figured roughly at 95 *pesos* and is now worth under 70 *pesos* per ton. The ill effect of this upon the reputation of the camp seems to have been more than offset by the recent rich finds of high-grade sulphides in the lower levels of El Oro mine; as these workings are 200 ft. below the lowest workings of the Esperanza, it is taken as proof that the ore persists in depth. Added to this good feature is the splendid appearance of the workings in La Prueba of the Santa Rita company. As the Descubridora has now passed through the cap and is in the slate, encouraging reports are expected from there almost daily. Following the lead of the larger companies, complete electrical equipment has been ordered by both the Chihuahua of El Oro and the Borda Antigua companies, that of the latter having been ordered from Braniff & Co., agents in Mexico for the Westinghouse Co., and the equipment for the mines, together with the new 20-stamp mill, will show

an aggregate of 500 h.p. It is believed the saving over fuel will pay for the equipment aud installation in a year. The Borda Antigua is already preparing for a heavier production from the mine and a larger mill.

The first shipment of 50 tons of high-grade gold ore has been received from the Garduño of the Rio del Oro Exploration Co., in the Balsas district, aud much is expected of the property. Much attention is being paid to the mineral districts of Noxtepec, Poder de Dios, Tetipac, and the Pregoues valley, all near Taxco, and success is likely to follow the properly managed company that goes into any one of these districts.

After about six months spent in alterations and building and a little over a year in actual smelting operations, the Augangeo Metallurgical Co. has closed down its plant as an impractical proposition. This company just two years ago took up under lease the mines and smelter of the Michoacan Mining & Railway Co. at Augangeo and Trojes, Michoacan, after having had them thoroughly examined by several mining engineers and metallurgists. The old smelting plant was entirely gone over and practically rebuilt, all the machinery being run by water-power obtained in the immediate vicinity. Just as the furnace was ready to blow in, a flood came along and almost wiped out the works, necessitating a heavy expenditure in rebuilding. Then an inefficient superintendent for many months caused continued failures, until finally a capable man was obtained and as far as operations were concerned there was no difficulty. After about eight months under the most favorable conditions, consistent with the lease the company held, it was found necessary to close down. The principal causes for the failure were excessively high royalties on a low-grade copper ore; expensive mining, by reason of the wet and poorly developed mines of the English company; high-priced coke, and difficulty of obtaining custom ore. The main trouble, however, was understood to be the high royalty, and unless more reasonable terms can be obtained from the English company, the Augangeo Metallurgical Co., though it has spent something like 300,000 *pesos*, will permanently abandon operations.

The Santa Casilda Copper Co., near La Lombardia, in the Uruapan district, and tributary to the Marquex, Balsas, and Santa Casilda rivers, is said to be producing close to 200 tons per day of 5% copper ore and paying 20% on a capital of 1,500,000 *pesos*. The company is building a concentrating plant so as to make a cleaner product. It is also understood that negotiations are pending for purchase.

Map of Mexico.

The success of Mexico's new coinage law is shown in the statement recently made by the Government to the effect that there have been coined from May 1, 1905, to March 25, 1907, pieces to the value of 80,151,616 *pesos*, of which 57,916,500 is in gold coin ten *pesos* and five *pesos*, the unit of the system being a *peso* containing 75 centigrams of pure gold. There has also been coined 20,970,000 *pesos* in subsidiary silver and the remainder in *centavos;* the total amounts to practically 6 *pesos* per capita of the pop-

ulation. In addition to this there are 98,184,395 in bank bills and from 15,000,000 to 30,000,000 in the old coins not yet redeemed (the exact amount being impossible to figure because of the heavy exportation of past years), or a grand total in circulation of approximately 200,000,000 *pesos*. Of this the bank had on deposit January 31, 1906, 63,574,518. The mints continue the coinage of all the pieces except the silver *peso* up to full capacity, and it is understood that the coinage of the silver *peso*, of entirely new design, will be resumed some time this summer.

Butte, Montana.

The Anaconda Report.—Interesting Details.—Enormous Output.—Good Showing in Depth.—Plans for the Future.

At the annual meeting of the stockholders of the Anaconda Copper Mining Co., held at the Washoe smelter last week, H. H. Rogers, William Rockefeller, John D. Ryan, John E. Judson, E. C. Bogert, William L. Bull, and George H. Church were elected trustees. John D. Ryan, president of the company, submitted his annual report. This shows that 1906 was the biggest year in the history of the company, the profits having been $8,842,669. The balance sheet gives the following interesting figures:

Capital, in 1,200,000 shares at $25 each	$30,000,000	
Accounts and wages payable, including taxes	1,670,239	
Dividend No. 25, payable January 17	2,100,000	
Balance December 31, 1905		$7,210,572
Profit for year ending December 31, 1906	8,842,669	
Deduct four dividends paid	6,900,000	16,083,241
Leaving net surplus		9,183,241

The assets include the following:

Fixed assets, including mines, mining claims, lands for reduction plants, tailing, ditches, sawmills, townsites, etc	20,514,706	
Buildings, machinery at mines, sawmills, refinery, foundries, waterworks, etc	3,923,057	
Investments in sundry companies	531,560	
Insurance unexpired	48,468	
Materials and supplies for use in future operations	1,438,578	
Merchandise held for sale	565,926	
Copper, gold, and silver on hand	5,306,003	
Loans and accounts receivable	10,636,132	
Total assets		$42,964,430

The profit and loss account for 1906 shows:

Copper, silver, and gold on hand at beginning of year	85,761,104	
Mining expenses, including development and depreciation	5,870,439	
Ore, matte, and copper purchases	315,091	
Transportation on mines to reduction works	234,149	
Reduction expenses at Anaconda, including depreciation	4,424,278	
Transportation of metals from West to East, refining, and selling expenses	1,721,965	
Administration expenses	57,672	
Balance, not including interest	8,584,169	
Total		$26,968,869
Sales of copper, silver, and gold	$20,955,532	
Royalties	60,631	
Dividends on investments	36,100	
Rental of water rights	50,000	
Miscellaneous receipts	172,988	
Net profits of subsidiary departments, after deducting depletion of coal and timber plants, and depreciation of plants and equipment	387,615	
Copper, silver, and gold on hand at end of year	5,306,003	
Total		$26,968,869

Mr. Ryan says that all departments were in continuous operation during the year, and an increased amount of ore was treated for other companies, thus reducing the cost of treating its own ores. On account of the higher price for copper, there has been a greater proportion of low-grade ore mined, and the reserves of the high-grade ore have been increased largely. Through the economies introduced in the operation of mines and the smelter, and the higher price for copper, it was possible during the year to mine at a profit ore as much as 1% lower in copper than the lowest grade considered profitable during the last few years. Mr. Ryan speaks of the settlement of all the litigation in which the company had been involved, and the acquisition of the Belmont mine, confirming the report that it is the intention of the company to convert the Belmont shaft into a large three-compartment shaft and connect it with all the important levels of the Anaconda group of mines, thus providing additional outlet for ore. He also mentions the settlement of the labor questions and wage schedule based on the price of copper. The development of the mines has been pushed, and the important shafts were sunk deeper. The 2,200 and the 2,400-ft. levels of the Anaconda, the 2,200 of the Never Sweat, and the 2,000 of the St. Lawrence, on all of which the main Anaconda vein was cut, are now open and ready for stoping. The width and value of the veins at those depths are very satisfactory. On the 1,600-ft. level of the Anaconda extensive development work has been done on the south vein in high-grade ore. The Never Sweat shaft is now at the 2,400-ft. level, but the veins have not been cut at that depth. The St. Lawrence shaft is down 2,100 ft. In this mine No. 5 vein has been developed on the 1,500 and 1,600-ft. levels and shows good ore. The High Ore shaft has been sunk during the year from the 2,200 to the 2,600-ft. level, and one vein was cross-cut at the 2,400, showing pay-ore. The Diamond and Bell mines were not deepened during the year. A vein of good ore has been opened to the south of the former workings in the Diamond and Bell, and on five levels has been followed, showing good ore of considerable width. Ore of good grade has been opened in the Mountain Con. below the 400. The Gallatin, J. I. C., and Belmont produced a limited tonnage of fair-grade material, and all the mines of the company during the year produced 1,450,601 tons of ore. A good profit was netted from the precipitating plants.

The reduction works of the company treated 3,006,910 dry tons of ore and other material, of which 1,494,828 tons were ore, 18,496 tons slime, 3,324 tons flue-dust, 166,516 tons slag, and 654 tons of miscellaneous cleanings from the old works, from which there was produced 94,963,835 tons copper, 2,979,908 oz. silver, and 15,984 oz. gold. Additional blast-furnace capacity and McDougall roasting furnaces were added during the year, and still further extensions are under construction. The electrical equipment of the concentrator has been completed, and an experimental plant to leach tailing from the dumps of the old works has been running with success and profit. An increased product of arsenic has been recovered from the flue-dust, and a good price is being received for it on contract for the entire output.

The subsidiary departments made profits of $387,615. The coal mines at Belt produced 291,851 tons of coal. The sawmills at Hamilton cut 39,832,867 ft. of lumber and timber, of which 4,545,223 went into company use and 35,287,644 ft. were sold. The Butte, Anaconda & Pacific railway, owned by the company, transported during the year 4,615,146 tons of freight and ore, and 195,630 passengers; gross earnings were $1,187,837; operating expenses, $755,735; taxes, interests on bonds, and rental on leased lines, $89,907; net income, $342,193. A dividend of 6% on the railway capital stock was paid, amounting to $60,000, leaving a surplus for the year of $282,193.

During the severe weather last winter it was found that the large tonnage of ore handled, when frozen, would tie up more equipment than the railway has available, so four additional locomotives, 100 steel dump-cars, and 75 flat cars, have been ordered and should be delivered before the beginning of next winter.

Cripple Creek, Colorado.

Treatment of Tailing.—Activity of Lessees.—Unwatering the Gold Coin.—Suit Between the Portland and Independence.—The Drainage Adit is Started.—Experiments on Low-Grade Ores.

The American Milling & Reduction Co. has recently been incorporated, with Colorado Springs as the principal place of business. The company has under consideration the erection of a plant to treat the large tailing dump of the old Gillett mill, situated near the town of that name in the northern part of the Cripple Creek district. An average value of $5 per ton has been obtained from the tailing.——A new vein has been encountered on the 1,200-ft. level of the Portland No. 2 shaft on Battle Mtn. A cross-cut at this depth found the vein 100 ft. north of the shaft. The vein is four feet wide and assays about $20 per ton. The cross-cut will be continued to connect with the winze sunk from the 1,100-ft. level, which shows some ore all the way.

Ore is being shipped from the Gold Dollar mine on Beacon hill. Returns around $30 per ton have recently been obtained from two carloads shipped to the Eagle sampler. The Beacon Hill Development Co. has this property under lease, the ore being obtained from a 3-ft. vein on the 600-ft. level of the Mabel M. shaft.——The operation of uncovering the pump on the 1,000-ft. level of the Gold Coin shaft of the Granite company has not, as yet, been successful. Various mishaps have attended the use of the bailer in lowering the water; at one time the guides in the shaft were torn up for several hundred feet, necessitating repairs. It is doubtful whether the size of the pump and water-column is sufficiently great to undertake the draining of the Battle Mtn. properties, as suggested, through the Gold Coin shaft.

The suit of the Portland Gold Mining Co. *vs.* Stratton's Independence, Ltd., will come up for trial before Judge Lewis in the Federal Court on May 20. The plaintiff company sues for damages approximating $100,000, for ore said to have been extracted by the defendant company and its lessees from the plaintiff's property. Both companies have had engineers examining the disputed territory and the case will be of much interest.——Last Saturday, the 11th inst., the starting of the work on the deep drainage tunnel was celebrated. The day was a general holiday in the district and many hundreds of visitors came from Denver, Pueblo, and Colorado Springs to witness the proceedings and see the camp. Lieutenant-Governor Harper started the compressor, and two drills that were already in place commenced work on the bore. The driving should now go on uninterruptedly.——The Golden Cycle mine resumed operations on the 14th inst. after a shut-down of two months, during which time skips have been installed in the main shaft to facilitate the handling of the ore. The Theresa shaft will be used for lowering the men and timbers. Development work will be continued on the 1,200-ft. level, where a cross-cut is being driven from the Legal Tender vein in a northwesterly direction to cut, if possible, the Hill vein, which should not be far off.

The experimental tests being conducted at the new Blue Flag cyanide mill are turning out favorably. About 25 tons of the low-grade ore is being handled, which will be increased to 75 tons per day when the tests are concluded.——The sinking of the Index shaft a distance of 200 ft. has been completed by the Ætna Leasing Co. The shaft is now 970 ft. deep and stations have been cut at the 870 and 970-ft. levels. Cross-cutting is in progress, with the hope of cutting the extensions of the Pointer, Mint, and Keystone veins. Shipments have been curtailed during the sinking of the shaft to two or three cars per week. Ore is being mined by the company on the 365-ft. level and on the 700-ft. level by Martinson & Co., lessees.

The British-American Mining Co. has declared a dividend of $2,500. This company has a lease on the South Dante on Bull hill, and is sinking a shaft to connect with the Dante workings above the Trail tunnel. Sinking is going on rapidly, a depth of 75 ft. having now been attained. An 8 by 10-in. hoist and 40-h.p. boiler are being installed at the shaft. The air for the drills is being obtained from the big compressor at the Logan mine, but on completion of the shaft a compressor will be installed by the British-American Co.——A strike is reported on the Rose Nichol mine, situated on Battle Mtn. The Columbia Leasing & Development Co. is operating this property and has found a vein from 4 to 5 ft. wide on the 450-ft. level.

An experimental cyanide mill for the treatment of low-grade oxidized ore from the Cariolanus lease on Battle Mtn. is being erected. The mill is being built at the mouth of the Columbine adit in Eclipse gulch, through which operations are being conducted.——A contract has been awarded to J. C. Kenard and C. K. Koocher to sink the main shaft of the Delmonico mine on the southwest slope of Ironclad hill from the 600 to the 1,000-ft. level. Forty days are allowed to complete each 100-ft. lift, at which a station is to be cut, and an indemnity bond of $1,500 is to be deposited by the contractors. Large bodies of low-grade oxidized ore are exposed in the upper levels of the mine.

London.

Zinc Corporation.—Battle of the Processes.—The Elmore Oil Process.—Report of Esperanza.—Other Mexican News.—Camp Bird Report.—Australian Companies in Cornwall.—Production of the Waihi Mine.

The difficulties of the Zinc Corporation Ltd. have now been explained by a circular issued by the London committee. It appears that in August last, after a long time and a great deal of money had been spent on experiments, with the Potter process, it became clear that this process, unaided, was not a success, but in consequence of Mr. A. L. Queneau's conviction that the Potter process, with the addition of magnetic separation, would produce better results than could be obtained in any other way, his recommendation was adopted, and Mr. Queneau was appointed manager. After six months' trial, during which the promised results were not attained, with the exception of one run of 1,300 tons, he was superseded. Mr. Huntley was appointed manager. Mr. Hoover (a partner in the firm of Messrs. Bewick, Moreing & Co. and a director of the company) had just then arrived on the field, and after some further experiments with the Potter process, this was finally thrown out and the Cattermole process adopted, as reported in my correspondence early in April. The last named process is owned by Minerals Separation Ltd., and at the Central mine, Broken Hill, the recovery from 4,178 tons of tailing was 76% silver, 70% lead, 81% zinc; and from 1,954 tons, 74.6% silver, 67.8% lead, and 83% zinc. Owing to the great delay involved by the experiments with the Potter process the capital of the Zinc Corporation will not be sufficient to carry the Company forward until the No. 1 plant of 1,000 tons per day will be in work; therefore, a temporary loan of £50,000 has been raised among a few large shareholders, which, with the balance in hand, will enable the company to meet its liabilities and construction work for the next three months, during which time the results of work on a large commercial scale will have been ob-

tained. The latest progress is reported in a cablegram from the Melbourne office, giving details of the production for three weeks to April 20. For the first week the extraction was 60%, for the second 70%, and for the third 73.6%, which figures are considerably below the 81% and 83% previously reported, and compare with 85%, which was expected from the Potter process. In all, 594 tons of concentrate, averaging about 45% zinc, 9% lead, and 10 oz. silver, were produced from 2,325 tons of tailing; but the assay-values cannot be given until agreed with the shippers' representatives, and no particulars as to working costs are mentioned.

Meantime the battle of the processes proceeds unabated. It is announced that the British Ore Concentration Syndicate Ltd. (owners of the British Elmore patents), has issued a writ for infringement against the Minerals Separation Ltd., holders of the Sulman, Picard & Ballot patents, generally known as the Cattermole process. Mr. A. S. Elmore, presiding at the first annual general meeting of the Ore Concentration Co. held last week, stated that the important installation of the Company's process now being made at the Cape Copper Co.'s mine in Namaqualand would yield a handsome return on their investment. Among the numerous contracts now in hand, they were carrying out trials on a bulk parcel of low-grade banket ore from a well known mine on the Rand at the Company's testing works in London. He referred to the successful work done on the Broken Hill zinc tailing, and was satisfied that when some of the much advertised processes had become extinct by reason of their high working costs and other disabilities, the Company's process—because of its low working costs, high efficiency, and extreme simplicity—would find a large application in the field. As indicating the rapid development of the business during the last few months, he mentioned that 72 machines were on order, seven of these being for Great Britain. A striking testimonial had been received from the Sulitelma company in Norway, which after installing one of the Company's 5-ft. machines had ordered 18 additional machines. While the Elmore process, in its fundamental form, is well known to professional men, the uninitiated layman may find the following description useful. The action of the process depends on the affinity between oil and metallic ores and the reluctance of the gangue to mix with oil. A small proportion of heavy oil and acid is thoroughly mixed with the pulped ore and a fair quantity of water. The oil attaches itself to the particles of ore, but leaves the gangue absolutely untouched. The mixture flows in a continuous stream through a vessel, in which it is subjected to a vacuum. This extracts the air dissolved in the water, in the form of minute bubbles. These attach themselves to the oiled particles of ore, which then float to the surface of the water, and are collected as they are washed over the top edge of the vacuum vessel by the flow of water. The gangue remains at the bottom of the water, and is drawn off by a tailing-pipe. The amount of oil and acid used is so small, and the cost so low, that they need hardly be considered. The amount of power also is small. A unit, consisting of a 5-ft. Huntington mill, 3-ft. concentrator, and all the auxiliaries, can be driven by about 18 h.p. One of the most striking results obtained by the Elmore process is a 98.2% recovery of zinc from the tailing at Broken Hill. But it is said to be equally applicable to almost all metallic ores. A 96.4% recovery of gold from antimonial quartz, 97% of molybdenum, and 99% of copper from Welsh slate gangue is given among the results.

In their third annual report the Esperanza directors are able again to congratulate the shareholders on the "phenomenal yield of gold" which the property has made in the past year. The Company was formed in October, 1903, with a capital of £455,000 in £1 shares, to acquire 449,800 out of a total of 450,000 shares of $5 each in the Esperanza Mining Co., registered in New Jersey, the property of the American venture consisting of approximately 384 acres, adjoining the El Oro mine in Mexico, with a battery of 120 stamps and cyanide-plant. Dividends commenced in June, 1904, and up to January last the distributions have amounted to £2 10s. 6d. per share, or 252½%. During the past year 207,183 metric tons (2,205 lb.) of ore were produced, as compared with 204,299 tons in the preceding 14 months, the value of the bullion extracted having been £1,581,309, as against £1,095,768. The net profit on the year's operations was £952,673, contrasting with £384,143 for the previous 14 months, while the dividends, totaling 160% for the twelve months, amount to £703,859, as against 82½%, taking £375,375, in the previous period. The American company, after providing the last dividend for the Esperanza shareholders, had a balance of cash and realizable assets of £455,757, or a little more than the total capital of the owning undertaking. In addition to the ore reserves, which are expected to leave a profit of about £304,000, there are several points in the mine where pay-ore is now being developed; while on the west veins on the sixth level, north and intermediate, the ore is extending farther to the north than was expected. The recent developments in the northern portion of the property near the line between the Mexican mine and the Esperanza, have been favorable, although the work has not at present advanced sufficiently to permit of a definite statement as to its value. On the sixth intermediate level on the west vein, the north drift is still going forward, and the breast at the close of the year showed the vein to be 7½ ft. wide, assaying 12 oz. gold per metric ton, and on the sixth level itself there is a vein of 4½ ft. quartz, assaying 4 oz. per ton. Recent developments on the San Rafael vein in the El Oro mine, 300 ft. deeper than the Esperanza seventh level and about 500 ft. from the south boundary of the Esperanza, indicate the probability of the occurrence of another ore zone in depth. The monthly report for March states that the mill ran 26 days and crushed 11,942 tons of dry ore. Shipped to smelter 1,703 tons dry ore. Net estimated profit at the mine, $122,023. Shipping ore on hand, 1,400 tons. The shortage of cars still continues. Development work, 784 feet.

The profit for March of the neighboring El Oro mine is also announced, the amount being $81,625. Dolores shows a profit for the same month of $24,000. The English company—Dolores Ltd.—has declared a further interim dividend of 3%, making in all 6% on the issued capital of £396,000 up to the present. It is rumored that the mine is not looking quite so well at the bottom level, also that some little time must still elapse, owing to the continued delays on the railway and the mule-trail, before the mill can be working to full capacity.

The profit at the Camp Bird for the month of March was $164,585. The mill ran 30 days, and crushed 6,069 tons of ore (dry weight), yielding 10,757 oz. bullion, and approximately 679 tons of concentrate. There was expended on construction $695, making a total for the year commencing May 1, 1906, of $26,564. Feet of development work, 637.

Two London companies operating in Western Australia, the Cosmopolitan Proprietary and Hannan's Proprietary, have conjointly taken over a tin mine in Cornwall—the Phœnix United. The property consists of about 560 acres, and is held under lease direct from the owners, the Duchy of Cornwall. The Phœnix has been

a large producer in the past, it is said, but has not been worked for ten years. Experts seem to be of the opinion that if the mine is fully opened and equipped with modern machinery, it might be worked to advantage. It is understood that the plans and specifications for the necessary plant for unwatering have been prepared, and a large proportion of the plant ordered. It appears that the amount to be provided for the development and equipment of the Phœnix is £75,000. It is announced that Capt. Oates has been appointed local manager of the Wheal Jane group of mines, in the Chacewater-Kea district, where A. W. Jenkins is the general manager. Pumping will soon be in operation at Wheal Vor, R. Arthur Thomas having laid out a modern plant for dealing with the minerals of this once famous sett.

Waihi, the premier New Zealand gold mine, has issued its annual report for 1906. The *Financial News* sums up the broad results of the Company's working during the past three years in the subjoined table:

	1904.	1905.	1906.
	£	£	£
Gross revenue	68,147	733,561	847,197
Working expenses	317,993	316,968	345,123
Depreciation, etc.	58,489	70,039	93,281
Net profit	311,665	346,554	408,793
Rate of dividend, %	60	65	75
Ore crushed (tons)	291,175	298,531	328,866
Yield per ton	46s. 2d.	48s. 9d.	51s.
Costs " "	22s.	21s.	20s. 6d.
Profit " "	24s. 2d.	27s. 9d.	30s. 6d.
Ore reserves (short tons)	712,791	938,334	1,029,658

The report states that on the whole the developments of the mine seem to point to a long continuance of prosperity.

Johannesburg, Transvaal.

The Driefontein Accident. — Bad Industrial Conditions. — Political Uncertainty.—Gold Production.—Usefulness of Tube-Mills.

The most distressing mine accident known in the history of the Rand occurred at the Driefontein Consolidated mine about a week ago. There have been many accidents in the past where the loss of life was nearly as high, but never have the victims suffered such agony as the poor fellows at the Driefontein mine, before death came as a merciful deliverer. Sixty-three lives were lost, of whom nine were white men. It is not yet known exactly how the accident occurred. There seems to have been two cases of dynamite (100 lb.) at one of the underground stations. The men were waiting, after the end of the shift, to ride up in the skip. Through the criminal carelessness of some one, the dynamite caught fire. It blazed rapidly, burning the men on the station most cruelly, and then exploded. The vast majority of the victims were blown to pieces, but some were rescued, and died later in the hospital. As far as the law is concerned there is probably no mining country better provided than the Transvaal. The regulations regarding explosives are excellent, and were they carried out to the letter, there would never be an accident from the use of explosives. But the miners are very careless, in spite of the fines that the Government officials make them pay for breaking the regulations. The Driefontein Consolidated mine is one of the East Rand group, which group is in the unenviable position of holding two records, namely, the highest working cost per ton, and the highest accident death-rate. This group is the most 'centralized' on the Rand. They do not have a mine manager on each mine responsible for everything on that mine, but run all their mines from one head office.

The distress in our midst does not get less. The unemployed camp, near Johannesburg, still contains hundreds of idle men. The Town Council made room for a number of white men, by discharging some Kaffirs, but now they seem to grudge the extra expense, and will revert to cheap Kaffir labor again. All the charitable institutions are taxed to the uttermost, and are continually appealing for help. All over South Africa the depression is very pronounced. The root cause of the trouble is the instability of affairs. No one has any idea what the Transvaal ministry, under Botha, will do about the question of unskilled labor. The dread that 20,000 Chinese will be compelled to leave the mines by the end of this year hangs like a heavy cloud over the industrial community. Many of the mines in the poorer zones will probably be compelled to close down, when the highly efficient Chinese labor is sent away. During the past fortnight one of the mines in the Roodeport district announced that all operations would be suspended at the end of this month.

The difference between labor conditions in South Africa and the United States is impressive. If several mines close down there, the workmen seem to find a chance elsewhere quickly, but in this country when a few hundred white men are thrown out of work in Johannesburg, they create a problem of the unemployed. In one sense it is true that "Johannesburg is South Africa," and if

Map of South Africa.

men cannot find employment in the great industry on the Rand, there is not much hope for them anywhere else. The power of South Africa to absorb white immigrants is painfully small.

The returns for last month show that March was a satisfactory month. The output did not reach the record one of December last, when 550,167 oz. were declared; but the March output of 538,497 oz. of gold for the Transvaal, valued at £2,287,391, is highly satisfactory, when it is remembered that there was one holiday, Good Friday, during the month. Of the total Transvaal output of 538,197 oz., the Rand supplied 520,163 oz. During March there were 8,540 stamps at work in the Transvaal, of which 8,190 stamps were crushing on the Rand. The influence of tube-mills is shown in the high duty per stamp recorded by some of the mines using them. The Luipaard's Vlei Estate mine reports the very high duty of 8.2 tons per stamp per 21 hours. This is probably a world's record for an ordinary gravity stamp. The lowest stamp duty is that of the Windsor mine, which crushed 3.5 tons per stamp per day. The mill on this property is an antiquated one. The premier producer in March was the Simmer & Jack, which turned out 23,113 oz. fine gold. The Robinson came next with 22,259 oz., while the Robinson Deep was third with 20,725 oz. There were twelve companies that report a recovery of 12,000 oz. and over.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

WHERE a mining claim becomes subject to forfeiture for failure to perform the annual assessment work, such improvements or betterments as may have been theretofore placed thereon, if they fall within the class designated as fixtures, become a part of the realty, and the subsequent appropriation of the land under a valid re-location, carries with it necessarily whatever may be affixed to it. In other words the fixed improvements passed to the re-locator.

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dency is noted, to draw boys who have never seen a mine, and whose parents or relatives have no idea whatever of what the business is. In considering the fields of industry open to him, the average boy is left to his own devices and can choose what course he will in college. At this tender age, slight influences often result in a decision. While it sounds like an absurdity, I have no doubt that many a boy in knickerbockers has made his decision to be a mining engineer after reading some of the highly colored fiction that is written about the mining business. How many youths have been influenced in their decision to become mining engineers after seeing such plays as Davis' 'Soldiers of Fortune,' where all the young engineer has to do is to accept the challenge of the great hills of hematite which "defy him like the knuckles of a giant fist," draw a large salary, dress in riding breeches or evening clothes, drink long cold drinks under the shade of a palm, and finally marry the president's beautiful daughter. It is a fine idea, and the boy has no one to tell him that this isn't the way it generally works out. Whatever the deciding influence may be, whether fiction, the drama, the newspaper stories, and magazine articles dealing with the romance of mining, or the fact that his father knows a man whose brother made a fortune in mining somewhere 'out West,' and will undoubtedly give him a good job when he gets out, the youngster's next step is to send for he literature published by the school. This he goes over carefully with his family, and finds that "graduates are much in demand," and the list of alumni shows mine owners, managers, consulting engineers, and superintendents scattered from one end of the earth to the other. Looks attractive? Of course it does. That's what it is for. Also, father has heard that everyone who graduates is immediately snapped up at a salary of at least $150 per month, and the romance and mystery of the thing appeals to boy, relatives, and friends alike, and the result is that the boy is packed off to school to become a 'mining engineer' in the short space of three or four years, and lives to regret his choice until the end of his days. I once saw a youth on his arrival in a quiet little college town, with a big new six-shooter sticking out over his hip. For hadn't he read that it was a rough, romantic life, where millions are made and lost in a day, and where one must needs be quick on the trigger. This same youth is now bucking samples in Colorado, and he doesn't pack any gun.

The effect of this exaggeration on the graduate is to make him dissatisfied with his position, and to discourage him by making him feel that he has dropped behind in the race, as he sees by the book that all his classmates are doing better than he. His shame at this may even draw him into deliberate falsehood, in order that he may make as good a showing as the next man (on paper).

The effect on the employing public is a tendency to discredit the list of positions as meaningless when they attempt to pick a man for their own use; while the effect on the school that is a party to all this must be demoralizing. Wherein does the ultimate gain lie? Why not tell the absolute truth about your graduates? If they are mucking, say so; if they are crooked over a drawing-board, as many of them are, record it; and if they are furnishing the motive-power for a one-ton car up a 6% grade, *write it down*. For what does all this attempt to represent the business of mining engineering as a long rosy path amount to if it fools no one in the end; not even the boy who decides to take it up, and does not wake up until it is too late to back out.

Many amusing cases come to view to one who has a chance to compare the reported and actual status of these young graduates. I read of a man who is 'assistant engineer,' and find him tramming with a bunch of Mexicans, his engineering consisting in holding an end of a tape once a week while the shift-boss measures the drift-work. A 'chief engineer' of a big company that ends its title with Consolidated Mines Co., Ltd., is a draftsman at mucker's pay. An 'assayer,' I find bucking samples, at day's pay considerably less than any Dago in the camp is getting. I read of a man who is recorded as 'superintendent of tailings plant,' and on visiting him discover that he is the 'rag-man,' whose business it is to hose the canvas tables every 20 minutes for a 10-hour shift, but, as the company was financially irresponsible, he received not one dollar for his six months' work. A 'chief chemist' I find titrating copper samples at $75 per month, another 'chief engineer' squints through a telescope at a plumb-bob for $75 per month in a camp where a Hungarian gets $3 per day. I have the greatest respect for the man whose record I have before me; he states that he graduated, mined for a time with two companies, became a street-car conductor in an Eastern town, and then a clerk in a 'dairy lunch;' but I learn with regret that he died 11 years after graduation, while clerk in a lawyer's office in a little country town in an agricultural district. *There* was an honest man, but I cannot understand how the college authorities ever let that list be published. Perhaps it is to show that very rarely a man does appear who, through some strange combination of circumstances, does not acquire fame and fortune in a few years in the mining business. But this is the only example of the kind that I can find in a list of over 400 names. I am told that another man is general superintendent of a big mine and mill in Colorado; within six months I find him conducting a billiard and pool resort in Cripple Creek, and just learn that he is 'steering' for a stud-poker game in a Nevada camp. You may be sure those two last positions never appear in the list. They might have a tendency to decrease the size of the next freshman class.

Next I read of the annual report of a mining school, filed with the Governor of the State, in which the president asks for large appropriations for larger quarters, as the "demand for graduates is in excess of the supply," and the school must turn out more men. As I happen to know that out of a recent class of 40 graduates, only three men were placed through the school, and they in inferior positions paying less than manual-labor jobs in the same camps, I am inclined to be a little skeptical of future utterances by this man.

Examples like the above are to be seen on every side. But all this is not meant to indicate that the mining business is a poor one to follow. On the contrary, it is because it is a splendid and legitimate field for operation that we regret these little tricks by which it is handicapped. For, to look a little further into the matter, why should a man prefer, and have it appear, that he is 'engineer' for some company — which generally means surveyor — than that he is pounding a drill with a four-pound hammer. Why should he prefer to be 'assayer,' rather than jig-man in some mill. If I were looking for a man to act as superintendent or manager for some property, I should prefer a man who had started on the business end of a 'muck-stick,' and served his time at mining and timbering, rather than a man who had spent a similar amount of time adjusting a transit, working with a six-place logarithm table, and putting fancy titles on maps. If I had a producing property equipped with a mill, I would not put a man in charge because he had been assaying for five years. As far as learning anything about mining is concerned, outside of the atmosphere of his environment, a man might as well be cooking flapjacks in some 'dairy lunch,' as running through

the mechanical routine of 40 or 50 muffle-fusions per day, month after month. I would rather make the roustabout at the mill, or the tool-nipper at the mine, boss of this property, than the assayer. I think a good many men agree with me, and if this is true, then the man who subscribes to the plan of misleading reports of positions is defeating the very end for which he is striving. We see too few miners, timbermen, shift-bosses, and foremen on the lists. Facts seem to prove that the business of mining engineering presents quite a different problem to the young technical graduate at present than it did ten or fifteen years ago. At that time the number of graduates was small, and there was a corresponding brisk demand for their services. At present, there is hardly a State university that does not include in its curriculum a course in mining, while the long-established mining schools are turning out large classes each year. Price, supply, and demand being three variables so related that a change in one brings a change in all three, the result of a vastly augmented supply has lessened the demand and the price. Not to mince words, the field of mining engineering is as crowded as any profession, and the young graduate must make up his mind to travel a more or less rocky road, for the first few years at least. Upon graduation, he must make his way to some Western camp, and start at the bottom. One year on a tramcar, and two more spent wielding a Missouri No. 2 should not discourage him, for all his college course can do is to prepare him for learning, and for the first two or three years he is of little value to anyone, and is going to a practical school on another man's money. After several years of good hard work, an assistant superintendency may be the reward, and the man will then be in shape to 'deliver the goods.' At best, the practice of this profession means to an average man the relinquishment of practically all home ties and intellectual environment. It means years spent in some out-of-the-way place, working shoulder to shoulder with, and in positions subordinate to, uneducated and unintelligent men, who have learned how by years of experience. It precludes the possibility of early marriage, and eliminates any idea of planting your roof-tree for years after graduation. The ultimate aim of most engineers is probably to become consulting engineers, so as, at last, to make a comfortable home amid pleasant surroundings a possibility; but remember, that only a few 'arrive,' and the path is a rocky one.

So I say, that no man should take up mining as a profession, who is not big, and strong, and healthy, and willing to work with his hands, who is not willing to renounce the comforts and pleasures of home life, who is not willing to associate on equal terms with men less well endowed than himself, who cannot be meekly obedient to his intellectual inferiors, and who has not something of a roving disposition. If he has all these qualities, and will stay with it, mining is a good business for him. He must be prepared to live and work in high altitudes, in tropical fever-swamps, in desolate mountain ranges, and on desert wastes, and is at all times subject to the beck and call of capitalistic employers who regard him at best as an efficient machine, a link in the dividend-producing system. Of course, the first requirement in this, as in any other business, is intelligence. Without that the game is hopeless in any walk of life. But open the boy's eyes before he decides to make this his career. Don't feed him with a lot of balderdash, which will warp his judgment and pervert his decision. If possible, give him a summer's work in some mining camp before he goes to college, as it is only fair that he have some conception of what the work is that he is choosing for his life's effort, and this about the only profession that the average boy adopts by hearsay. He sees and understands something of the life and sphere of activity of men in other professions, such as doctors, lawyers, architects, electrical and mechanical engineers—in fact, almost every other profession open to him except mining, and this is in itself reason enough why, as the knowledge he is able to get from books and magazines is necessarily somewhat unreliable, the literature sent out by the colleges of mining should be accurate and conservative in all of its statements.

ONE OF THEM.

San Francisco, May 8.

A Disclaimer.

The Editor:

Sir—I will be glad to have enough space in the columns of your journal to call the attention of mining engineers and the public interested in mining, to the methods used by the agent of the Eastern Mining Company, a Manila, P. I., corporation, to dispose of stock in the United States, in connection with which my name, and that of Mr. H. D. McCaskey, formerly Chief of the Mining Bureau of the Philippine Ids. and now on the U. S. Geological Survey, is being used.

After three years service with the Government of the Philippine Ids. as Geologist of the Mining Bureau, I resigned to take the management of the Eastern Mining Company. I was convinced that the property was worthy of further development, and Mr. A. Heise, the president of the company, was sent to the United States to raise a larger amount of money than seemed to be available in Manila. His mission was to put before capitalists a business proposition, to raise funds from the sale of the capital stock which he was authorized to sell, and it was naturally presupposed that only legitimate business methods would be used.

On account of the distance, principally, and possibly through design, it is only recently that I have learned that there are being inserted in the papers of the United States, large advertisements which are full of misleading and false statements regarding the property of the Eastern Mining Company.

Some of these are the following:

"Sixteen quartz claims, all demonstrated perfect title, with U. S. patent, and 39 placer claims of 800 acres, averaging 35 cents per yard."

"Over $8,000,000 in sight on quartz claims."

"$100,000 have been spent in development work in the last five years."

"A 5-stamp mill actually at work, producing over $3,000 per month at the present time."

These assertions are gross exaggerations and in some cases are absolutely false.

The number of claims and the acreage is sufficiently accurate, but hardly a dollar's worth of work has been done on the placer ground, and it is wild imagination to place a value of 35 cents per yard on the ground.

There is *not* "$8,000,000 in sight on the quartz claims." The figures in my report to the directors are $100,000.

The amount of money spent in development work has mysteriously increased fourfold.

There is no "5-stamp mill actually at work on the property." A small (iron frame, 800-lb. stamps) mill was installed about two years ago and produced bullion to the total amount of about $5,000. It was a poor machine at best and was poorly erected. It broke down repeatedly, and its final collapse took place long before the person responsible for the advertisements left Manila for the United States, and he was, and is, perfectly familiar with the fact that it has not been running for over six months, and never did run but for a few weeks

at a time. There was no accuracy in the methods of operation, and all the operators were entirely ignorant of mining and milling, so that calculations of value per ton and the rate of extraction are founded on thin air.

The agent of the company who is responsible for such methods of selling stock was sent to the United States to raise funds by legitimate means, and it is entirely on his own responsibility that he has used such methods. The board of directors has voted its disapproval and taken steps to end such proceedings, and I, personally, have severed my connection with the company. In order that the true conditions may be learned by anyone interested, I have published an abstract of my report on the property, in the March number of the *Far Eastern Review*, a semi-technical journal of good standing, here in Manila.

Beyond the figures in that report and the statement of general conditions there, I can assume no responsibility.

A. J. EVELAND.

Manila, P. I., April 11.

Confidential Information Safeguarded.

The employees of the United States Geological Survey are apt, in the course of their work, to become possessed of information in regard to properties or regions examined that may be of a confidential nature and such as would not have been acquired had they not been engaged in such work. This is particularly true of geologists who make investigations relating to mines and mining districts. Property owners usually communicate freely all the geological facts in their possession to the examining geologist, because they realize that, although part of the information is confidential, such data will not be published by the geologist without the consent of the proper parties, except as a basis for conclusions and generalizations.

Those who have their property examined by officers of the Geological Survey will be interested to know that all scientific employees of the Geological Survey are requested to sign an agreement, in which the geologist pledges himself to bear in mind the fact that his position may enable him to learn facts that are not known to the general public, and that when such facts are of a confidential nature he will refrain from any mention of them that would tend to violate such confidence. He further pledges himself not to testify in any mining litigation before the United States, State, or Territorial courts during his employment on the Survey, and for three years after the termination of such employment not to act as expert in mining litigation concerning properties in any district in the United States upon which he has made any report or part of a report under the employ of the Survey, provided that this restriction shall not apply in any case where ten years shall have elapsed since the completion of the field work upon which any such report was based.

It will thus be seen that the Geological Survey tries in every possible manner to safeguard the interests of those with whom it has to deal, and that owners of property need have no fear that confidential information will be divulged.

THE use of mica for stove windows formerly constituted the principal demand for sheet mica, but this has decreased somewhat in recent years. The increased use of sheet mica in incandescent gas lamps and for miners' lamps has kept up the demand for glazing grades, so that whatever comes into the market is quickly bought. Sheet mica is also used to some extent for phonograph diaphragms and in various small novelties.

Rail Joints.

A track, being weakest at the joints of the rails, where they are deprived of their vertical strength, has of course a greater tendency to bend at those points; and this bending produces an irregularity in the movement of the car, especially if it be heavily loaded, which is detrimental both to the car and to the track. Moreover, that end of the rail upon which a wheel is moving bends more than the adjacent unloaded end of the next rail, so that when the wheel arrives at this second rail it imparts to its end a severe blow, which injures it. Thus the ends of rails are exposed to far more injury than other portions.

Numerous devices have been tried for strengthening the joints of the rails with a view to preventing this bending entirely, or at least of causing the two adjacent rail-ends to bend equally and together, so as to avoid the blows alluded to. None of these joint-fastenings, known as chains, fish-plates, wooden blocks, etc., have proved entirely satisfactory.

Much of the deficiency ascribed to fastenings is, however, really due to want of stability in the cross-ties at the joints, and more attention must be given to the latter before an efficient fastening can be attained. Observation shows that when the joint-ties are firmly bedded, almost any ordinary fastening will (if the joint is placed between two ties instead of resting on the tie) do well. On the other hand, if the joint-ties are so insecurely bedded as to play up and down half an inch or so under a heavily loaded car, the strongest and most effective fastening becomes inoperative. All the parts will become gradually loosened, warped, bent, or broken.

If the joint is placed between the ties it is called a 'suspended' one, if upon a tie a 'supported' one. Experience has shown the superiority of suspended joints over the supported kind. Long fastenings (as fish-plates) possess but little superiority over short ones where the track is not kept in good repair, for the greater bearing of the former, although imparting an increased firmness to a good track, in a bad one becomes converted into a powerful leverage by which it accellerates its own destruction. An element in the injury of joints is the omission of a proper fastening at the middle of the rail. The rail should be so firmly attached to the cross-ties at or near its middle point, as to compel the contraction and expansion to take place equally from that point toward each end. It is difficult to accomplish this perfectly. Attempts heretofore made have failed.

Under the extremes of temperature in the United States, steel expands or contracts 1 part in 916, consequently a rail 20 ft. long will vary fully a quarter of an inch in its total length. Besides, the rails are liable to move or creep bodily in the direction that the loaded cars move, especially if that direction is down-grade. By this process the joint-fastenings are exposed to additional strain and derangement. Rails appear to become slightly elongated at their ends by use, and this renders a full allowance for expansion and contraction the more necessary.

NEW SOUTH WALES coal is in high repute in the Philippines, and practically holds the market. The importations are increasing, and the opinion is expressed that, so long as the present quality and prices are maintained, Japanese coal will be unable to compete with the New South Wales coal. When more activity is displayed in railway construction, and more lines open to traffic, it would appear reasonable to expect increased importations from New South Wales, and certain deliveries at the southern extremity of the islands.

Water Resources of Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By HENRY THURTELL.

To one who lives among the green hills and abundant vegetation of the Middle States, the word Nevada conveys an impression of excessive dryness. No other State, except Arizona, bears such a reputation for lack of moisture. The traveler on the train looks out upon brown rolling hills and ragged lava-strewn mountains. The hills are not crowned with stately trees, but mountain and plain are alike covered with the aromatic sagebrush. The landscape gives little hint of the real bounty of nature in this apparent desolation. Under these gray old bushes grow the most fragrant and beautiful wild flowers. Falling down these rugged mountain sides are little streams of water fed by the melting snows upon the summits. Locked in these brown old hills are seams of ore carrying gold, silver, lead, and copper.

Carson River at Empire During Flood.

The streams of Nevada are small compared with the rivers of other States. The water nearly all runs toward the interior and empties into shallow lakes to evaporate there. The Humboldt river rises in the Ruby and Independence mountains in Elko county and flows west to the sink near Lovelocks. Beginning at the starting point of its longest tributary and following its devious course to its confluence with the other streams, thence to the sink of the Humboldt, the total distance is a thousand miles. The pathfinders that crossed from the Missouri river to California in the 'prairie schooners' of the bygone days of '49, followed the Humboldt river for hundreds of miles. Along its banks the stock of the emigrants found grass and rested after the wearying journey across western Utah and eastern Nevada. Along this emigrant road can be picked up old irons from ox-yokes and wagons, and here and there is to be seen an unmarked grave, a mute reminder of the tragedies of the desert. Along this road in early days, lurked savages ready to rob and murder the unwary. In the Lovelocks valley, during recent leveling for cultivation, land that was once covered by water of the Humboldt lake has been disturbed. Here several skulls were uncovered and at least a dozen gunbarrels. No record exists of any battle between belligerent tribes of Indians, or between whites and Indians, that took place near this point. Here, however, is such record as Nature herself was able to preserve of a tragedy unwritten and unknown. Here, perhaps, men worn out with travel or badly wounded crawled into the tules along the edge of the lake to rest or to hide from their enemies. This river, with its tributaries, drains nearly 11,000 square miles of land. The average annual rainfall is about 12 inches. The stream actually irrigates at present about 300,000 acres of land.

The Walker river rises among the high mountains on the western side of California and flows northeast into Nevada, watering on its way Antelope valley in California and Smith and Mason valleys in Nevada. It then rounds the north end of the Walker River mountains and turns south, emptying into Walker lake in Esmeralda county. It waters 50,000 acres of land and on both of its forks offers opportunity for power development. It flows through the Walker River reservation, first opened for settlement on October 29, 1906. The land in this reservation suitable for agricultural purposes, was nearly all reserved for the Indians and allotted to them in small farms. The tract opened for entry was mainly mineral land and on the day of the opening when the gun on the summit of the mountain gave the signal, there were 3,000 men waiting to stake the coveted ground. Old men and young joined in the rush, women too, with the fever of adventure in their blood; men on horseback, on foot, in automobiles, staid farmers who had lived within twenty miles of that reservation for forty years and men who had crossed a continent to take this chance, were there. Upon the reservation were several streams of water hitherto unappropriated; a right to water is initiated by an application to the State Engineer's office at Carson City. On the date of the opening, long before the hour of noon, a waiting line of men with applications prepared stood before the door of the Engineer's office. These applications were treated as if received simultaneously and their priority determined by lot.

Carson River During Flood.

The Carson river, like the Walker, rises in eastern

California and flows east and north into Nevada, watering between fifty and sixty thousand acres of land in Douglas, Ormsby, Lyon, and Churchill counties in Nevada. This river takes its name from the famous scout and guide Kit Carson, who accompanied the intrepid Fremont on his journey across Nevada along the Humboldt, Carson, and Walker rivers into California. The Carson valley, in Douglas county, was settled by the Mormons early in the 'fifties, but these settlers were later recalled to Utah by Brigham Young, then president of the Mormon church. This is an exceptionally fertile valley and is well cultivated. The east and west forks of the Carson both offer opportunities for power development that seem now about to be utilized. The river empties into the Carson sink in Churchill county and evaporates. When the Comstock mines were pouring out ore of phenomenal richness, it was hauled in cars to the Carson river and on its banks great mills were erected. The river furnished the power and the water necessary. Many of these mills are standing yet. Some are doing a little work; others have been torn down and moved away. The recent flood has torn out some of the old dams while nearly every bridge, from one end of the river to the other, was either utterly wrecked or put out of business.

The Truckee river is the outlet of Lake Tahoe and flows through Placer and Nevada counties in California and Washoe county in Nevada into Pyramid lake in Washoe county. Its total length is about 125 miles and in that distance the river falls nearly 2,500 ft. It is being used to generate power at five different points. At each point nearly the total available flow of the river is utilized and about 350 ft. of fall has been secured. About 7,000 h.p. is being generated and is being transmitted for lighting purposes to Truckee, Verdi, Reno, Carson, Virginia City, and Sparks. This power runs the paper-mill at Floriston, supplies energy for the pumps at Virginia City, for the hoist and mill at the Rocky Hill mine, for the hoist at Como, and it is now being transmitted to Yerington for use in the hoists for the copper mines there. The Truckee river, with its tributaries, waters about 50,000 acres of agricultural land and is not now over-appropriated. The Reclamation Service has constructed a great canal capable of diverting 1,400 sec.-ft. of water from the Truckee to the Carson, a distance of about 31 miles. This water will be stored in a great reservoir and used on 200,000 acres of land around the Carson sink in Churchill county. The Truckee river is almost an ideal trout stream. It is thoroughly stocked with the best of fish and sportsmen come from afar in order to enjoy the season of sport along its banks.

The Muddy river rises in springs in Lincoln county and flows south and east to its confluence with the Virgin about 20 miles north of the junction of that stream with the Colorado river at Rioville. The Muddy is only 40 miles long; in an Eastern State it would be called a creek. It carries about 50 sec.-ft. and this serves to water 3,000 acres of valuable land. This is an almost tropical climate; figs, apricots, and other fruits, as well as vegetables, are grown with entire success. The river is unique in that so large a volume of water comes entirely from springs in low mountains, in a country of slight rainfall. The moisture that feeds these springs must come from melting snow on mountain summits a hundred miles away.

The Reese river rises in the Toyabe and Shoshone ranges in Nye county and flows north toward the Humboldt. At one time it undoubtedly emptied into the Humboldt river at Battle Mtn., but now none of the water of the Reese ever reaches the Humboldt except in exceptional seasons. The stream is largely appropriated and irrigates 20,000 acres. On its tributaries it offers advantages for power transmission. The upper end of the river passes through a highly mineralized region where many valuable mines are now being worked. The town of Austin, near the Reese river, has been often mentioned as the ideal mining camp. The town is supplied with a good water-system. From her mines millions of treasure have been taken. The district, too, was settled more than forty years ago by a class of people that would have done credit to any country in which they might have made their homes. The old residents of Austin are distributed all over Nevada and California; wherever found they are law-abiding, industrious, progressive citizens.

The Quinn river in Humboldt county flows south and west and empties upon the Black Rock desert. It waters 10,000 acres. The river has a drainage area of about 4,000 square miles. The desert upon which it empties is worth more than a passing notice. It is the real thing. In the spring much of the surface is covered with water; later in the summer this water evaporates, leaving a dry hard surface across which one can drive in any direction with a loaded wagon. The surface is so hard and smooth that a carriage-wheel leaves scarcely a scratch. Not a spear of grass or shrub of any description breaks the monotonous landscape. Not a living creature, bird, beast, or reptile, seems to venture here. It is the picture of desolation, lonely beyond words, an unchanging, unpitying, silent, inscrutable waste. The most aggressive and enduring of creatures—man himself—dominant, unyielding, and resourceful, has laid down his life in an attempt to cross this desert without adequate preparation. It is 50 miles long and 20 miles wide. If there is a spot on earth that God forgot, it is this Black Rock desert of Nevada.

There are in Nevada scores of smaller streams watering limited areas. In many places one man alone owns or controls all the land capable of being watered by a stream. Here he can raise sufficient hay to feed, during a hard winter, a large herd of cattle or sheep, and during ten months or more of the year his stock finds free pasture upon the adjacent public land. The different mining companies in the State, in securing water for the milling of ores and for domestic purposes, have wrought little short of miracles.

Virginia City secures water from Lake Marlette, 30 miles away. The water is brought in a 10-in. pipe and at Lake View, where the pipe-line crosses the Virginia & Truckee railroad, it is nnder a static head of 1,680 ft. The pipe is nine-tenths of an inch thick. This system is said to have cost $1,000,000 to construct, but it has furnished for Virginia City an abundant supply of pure water. An apparent anomaly is the use of this water at high pressure in the Consolidated & California mine to pump water from the lower levels up to the Sutro tunnel, whence it is discharged by gravity.

The town of Ely in White Pine county, is being supplied with a modern system of water-supply and distribution. The water of Murry creek, which now flows through the town, is being diverted into a pipe and will soon be supplying each house in a convenient manner. The concentrator being built at McGill's, will be supplied with water from Duck creek and springs upon the McGill ranch. There is no donbt concerning the abundance of this water-supply to meet the needs of mining and smelting.

The older mining camps, like Pioche, Eureka, and Austin, all have been supplied with a fairly effective water-service sufficient for their needs, for domestic and milling purposes.

Tonopah derives her main water-supply from Rye-

patch, 14 miles west of town. A range of mountains lies between the wells and the town. The water is pumped to a height of 700 ft., where it is stored. From the reservoir it is carried by gravity to the consumers. The price charged by the water company seems high, but so is the expense of pumping; this results in a much smaller use of water than is usual in cities. Leaving out of consideration the water served to the mines for boilers and other purposes, and that used in mills, it is unlikely that more than ten gallons of water per day per capita is used in Tonopah for all the different household purposes. The Tonopah Mining Co. has a mill in operation at Miller's siding, 11 miles west of Tonopah. The water for milling purposes comes from adjacent wells.

Goldfield has probably gone farther to secure water than any other mining camp in the State. It has been able to secure water sufficient to supply absolute necessities from different wells that are all within a radius of six or seven miles of the town. These wells cannot yield more than 90,000 gal. per day, and Goldfield has 18,000 people dependent upon this water for drinking and domestic purposes. This means five gallons per day per capita, and this water, too, is not all used for drinking and domestic purposes. Some is used in the mines and mills, and some for the watering of stock. The people of Goldfield might easily be forgiven if they lost the habit of drinking water. Various substitutes have been used with entire satisfaction. During the last year a company was organized to gather up the water of all the springs around Mt. McGruder, and pipe the water to Goldfield. A supply of from 200,000 to 300,000 gal. each day will be secured from this source. The pipe-line is now nearly completed. It is 35 miles long, and this supply of excellent water will add greatly to the comfort and good health of the residents of Goldfield.

Rhyolite has three different water-systems, each distributing the water through pipes to its patrons. Probably 150,000 gal. per day is being supplied. Sufficient water can be obtained at a number of points along the Amargosa river to mill the ore of the Bullfrog mines. This is a stream called a "river" by courtesy only. At high water 100 sec.-ft. flow down its channel for 150 miles. At low water the channel is dry for long stretches. The water sinks and reappears many times. The stream runs southwest until it rounds the south end of the Funeral range of mountains; then it turns north and loses itself in the mysterious Death Valley of California.

The new discoveries of gold and silver in Nevada seem to be nearly all in low hills, with the result that many valuable finds have been made at a distance from the starting point of springs and streams. Water is at a premium, therefore, in many new camps. In Tonopah it was sold at $1.50 per barrel for nearly a year after the camp started. In Goldfield, it was sold at about the same price for a year or more. In Manhattan, it was sold until recently at $1 per bbl. In Greenwater, it sold for months at $10 per bbl., and was hard to obtain at any price. In Wonder, water is being piped from Bench creek. It is sold, at the end of the pipe, for three cents per gallon.

Many new camps have sprung into existence during the last year: Wonder, East Gate, West Gate, Middle Gate, and Hercules in Churchill county; Seven Troughs, Vernon, Rosebud, and Goldbud in Humboldt county; Lander and Tenabo in Lander county; Black Horse in White Pine county; Blair and Dutchman in Esmeralda county; Lee and Echo, near the California-Nevada State line; Round Mountain and Shoshone in Nye county. All are in the foothills and must get their water-supply from springs or creeks, in some cases, many miles away. In the valleys in the northern end of the State and in some of the valleys in the south, water can be obtained from the ground by digging a shallow well. In the irrigated valleys, the ground-water is only three feet below the surface in many places, and is seldom more than eight or ten feet. The top of this ground-water is not a plane and is not horizontal. It undulates much as does the surface itself. The mines themselves often afford a supply of water. The Virginia City mines have so much water in them that the pumping is the main expense of operation. The mines at Tonopah, however, have yielded, up to the present time, no water in quantity.

There are areas in Nevada as large as four townships, where no living water can be found. These spots are, however, rare. A prospector who knows the country can, with burro and pack outfit, go anywhere and maintain himself. Some of the stories of men perishing from thirst in Nevada are true. The seasoned prospector keeps well in mind where he will next connect with water. Flour or bacon or beans or coffee, he can do without if need be; but water he must not be without for any length of time.

The brilliant sunlight, the gray lonely plain, the dark ragged mountain, have their own peculiar charm when seen under conditions of reasonable comfort. If, however, the traveler be worn out and discouraged, hard-pressed for water, and uncertain where he will obtain his next supply, then the landscape has for him no beauty. It is a parched and arid plain. The gold locked in its hills has for him no lure. What he wants is water and he would almost give his immortal soul for the chance to lie down beside a sparkling brook and drink and drink.

It has long been known to scientists that good glass can be made by melting quartz crystal, and so cooling it as to prevent re-crystallization, but as quartz glass was obtainable only in the form of minute globules by means of an expensive process, the knowledge has never been turned to practical account. While experimenting recently with quartz in the electric furnace, there was incidentally discovered a method of producing quartz glass in larger quantities, obtaining perfect plates of it six inches long and two inches wide. Possessing certain remarkable and valuable properties peculiar to no other kind of glass, this substance is actually worth its weight in gold, and the importance of the discovery was great. Expansion of quartz glass when heated is imperceptible, and cold water may be poured over it when white hot without breaking it. Ordinary glass refuses to transmit the ultra-violet rays of the spectrum, while quartz glass transmits it freely. It is the best material for camera and telescope lenses, owing to its exceeding clarity, and its use is expected to widen the scope of astronomical research.

Newfoundland.—The colony has long been known to be rich in minerals, but thus far only copper, hematite, and pyrite mines are being operated on a large scale. Copper has been worked more or less extensively for about 50 years, and the annual output of late is about 70,000 tons, valued at $360,000. Hematite is exported to the extent of about 750,000 tons, valued at about as many dollars. Iron pyrite is sent away to the amount of 50,000 tons, valued at $240,000. The average value of mineral export for the past four years is $1,377,374, lesser products of barite, slate, talc, etc., being included. For some years past boring for coal under Government direction has been carried on over an extensive area in the interior, where the existence of carboniferous deposits has been proved, but thus far no substantial progress has been made finding any of commercial value.

The Lluvia de Oro District, Mexico.

Written for the MINING AND SCIENTIFIC PRESS
BY R. H. BURROWS.

This district, through its geological associations, is one of the most interesting in the Sierra Madre. It is situated in the western part of the State of Chihuahua, in the mining district of Andres del Rio and about five miles from the Sinaloa line, as shown by the accompanying sketch map of the region (Fig. 1). The approach

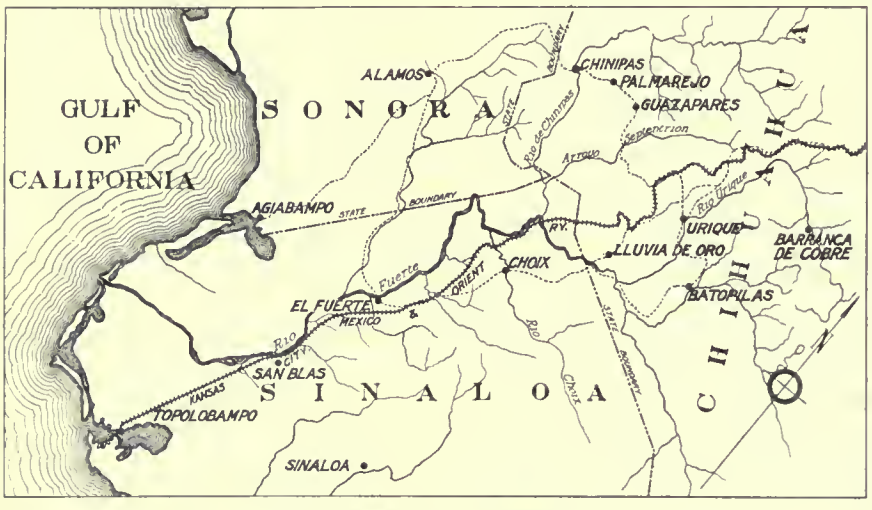


Fig. 1. Map of Part of Mexico.

from the Pacific side is by sea to Topolobampo, thence by the Kansas City, Mexico & Orient Railway to El Fuerte, finishing the trip with two days on muleback from El Fuerte to Lluvia de Oro. The traveler coming in by way of El Paso, goes westward from the city of Chihuahua over the K. C., M. & O. Ry., to its present terminus at Aguatos, from that point proceeding on muleback five days to Lluvia de Oro. The latter route is generally preferred, as it lies through the highlands of the Sierra in a region where the temperature is always cool and pleasant, and for the further reason of its communication with El Paso, which for the majority of people is the most convenient approach to the northern part of the Republic. Eventually, with the completion of the K. C., M. & O. Ry., this camp will have railroad connection east and west, as the main line of the railroad is surveyed within five miles of the Lluvia de Oro mine.

The circumstances connected with the discovery of this mine are sufficiently curious to merit narration. The existence of gold in the neighborhood had been known through the fact that Indians from that vicinity had, for a long time, brought in rich pieces of gold quartz to sell and trade at the stores, but, conformable to the Indian character, they had resolutely declined to reveal the locality from which the specimens were derived. Knowing these facts, a Mexican merchant, named Bernardo Garcia, established a small supply store in the village of Realito, which he supposed to be not far from the mine, it turning out afterward to be about six miles distant.

With the ostensible object of trading with the Indians and travelers between Batopilas and El Fuerte, but with the secret purpose of arriving at the knowledge of the Indian treasure house, Señor Garcia plodded along at Realito for several years, following up clew after clew, but without avail, until he took into his employ an individual named Espiridion, who joined native cunning with an intimate knowledge of the Indian character. Stimulated by the promise of reward, Espiridion wormed his way into the confidence of the Indians, frequently joining them in their drunken orgies, until at last they came to regard him almost as one of themselves. While it is hardly probable that Espiridion had any clear plan outlined in the method of his search, the fact remains that he persisted in cultivating the Indians, trusting, no doubt, to some chance accident to reveal the whereabouts of the coveted mine. Chance at last favored him; happening to be present at one of their periodical carousals, and feigning to be asleep or dead drunk, Espiridion caught a few words which caused him to listen with all his ears. Two of the individuals, forgetting their usual caution, or thinking it unnecessary under the circumstances, let fall certain remarks, and although very meagre, enough reached Espiridion to give him a clew to the location of the mine. A certain gulch was spoken of, and a few days afterward Espiridion took occasion to wander that way. Arriving near the head of the gulch, he found pieces of quartz containing visible gold. By following this he was led to the base of a limestone cliff, and cropping out of its face stood the quartz body that had dispensed its treasure of gold to the Indians, and which has since become famous as the Lluvia de Oro mine. This then was the mysterious mine and it far exceeded all expectations in richness and quantity of ore. The delighted eyes of the discoverer encountered a face of quartz, 10 ft. wide and 15 ft. high, with visible gold all through it; some of the

Fig. 2. Mill at El Chorro.

specimens broken off being loaded with the precious metal. Discovered and located in 1900 by Garcia, it was bought two years later by the present company for $1,750,000.* Garcia named the mine Lluvia de Oro,

*U. S. currency. We use *peso* for the Mexican dollar.—Editor.

which means 'Shower of Gold,' a name that has been abundantly justified by the production of the mine, which since the installation of the 20-stamp mill, has maintained an output of $80,000 per month.

The topography of the area under consideration, consists of a high ridge sloping southeast to the Fuerte river and northwest to the *arroyo* of Bahueraehic. The mine is situated on the southeast face and near the top of this ridge; the mill being at El Chorro (Fig. 2), on the Fuerte river. The difference in altitude between the mine and the mill is about 5,000 ft. and the distance is five miles; the ore being packed from mine to mill by mules and burros. This primitive method of transportation, however, will soon cease, as the company is at present getting ready for the installation of a cable tramway.

The orebodies occur in a bed of limestone, which crops out as a bold cliff along the east face of the ridge, and which has suffered extreme faulting and fracturing, the mineralized area having been raised about 2,500 ft. by the intrusion of a body of diabase, the latter now forming the underlying rock of the district. The uplifted portion is about five miles long, extending from the great vault near the Lluvia de Oro mine on the southwest to the *arroyo* of Balojaqui on the northeast, where the limestones dip under Gloriapan mountain. The annexed geological sketch is a partial section across this area, parallel to the outcrop of the sedimentary beds. Occupying the summit of the ridge and lying on the limestones is a massive dark-colored andesite of rather fine grain and generally much altered. This andesite is the remains of a flood of lava that was originally 1,000 ft. thick, antedating the great deluge of volcanic material that built up the Sierra Madre. Both of these formations at one time covered the area in question, but the extreme elevation and fracturing to which they were subjected having rendered them an easy prey to erosion, the volcanic material has been entirely carried away, and in some places the massive andesite has been eroded to such an extent as to expose the underlying limestone.

The upper member of the sedimentary series consists of 250 ft. of massive gray limestone, which is quite pure except where changed by later mineralization. This is the most prominent part of the formation, occurring as a conspicuous outcrop along almost the entire extent of the ridge. Directly underneath this is a layer of fossiliferous limestone, 20 ft. thick, crowded with shells of *rhynconella lacunosa*† and what appear to be *belemnite* pens; the latter, however, being too dim to identify. The finding of these *rhynconella* proved to be most important in the determination of the age of the beds, as up to this time the question had been in doubt, it having been generally supposed that the limestones near the west coast of Mexico corresponded to those that had been identified as Cretaceous along the Pacific border, farther north. As the above-mentioned fossil is characteristic of the Jurassic period, these limestones, therefore, may be determined as such and consequently lie in the same geological horizon as the limestones of Catorce.

†Determined by Jose G. Aguilera, Director of the Mexican Geological Institute.

Below the fossiliferous layer is found 300 ft. of thinly bedded limestones, passing at the base into mixed slate and limestone, the last formation 100 ft. thick and resting in turn upon 100 ft. of sandstones or tuffs in thin beds. The lower members of the strata are not always visible, being sometimes obscured by talus from the overlying formations, or hidden by faulting. The entire series of beds, about 770 ft. thick, may be observed on the Baltimore claim, two miles north of the Lluvia de Oro mine. The sedimentary beds, as far as could be seen, were conformable throughout. Immediately beneath the sedimentary beds, being continuous down to, and under, the Fuerte river, the diabase intrusion shows a thickness of at least 4,000 ft. It is probably contemporary with similar laccolitic intrusions near Urique and at Batopilas. Above the town of Urique, it forms the country rock of some of the rich veins, rising fully 2,000 ft. in the walls of the *barranca*, while at Batopilas it occupies the lower portion of the *cañon*, forming the country rock of the unique mineral deposits of that camp. The diabase probably rests upon a foundation of granite, as a few miles to the west of Lluvia de Oro, the granite is seen to rise while the diabase feathers out to nothing, and the sedimentary rocks rest immediately upon the granite.

Later than the diabase and finding expression in the shape of dikes that penetrate all the other rocks of the district, eruptions of rhyolite are prominent, protruding through fissures formed subsequent to the diabase intrusion. The most notable of these dikes is that which

Fig. 3. Village of Lluvia de Oro. Cliff to Right Marks the Great Fault.

occupies the fissure of the great fault directly west of the Lluvia de Oro mine, traversing the country as a conspicuous wall 20 to 50 ft. high for a distance of at least four miles, extending from the gulch below the village of Sierra northward into the *arroyo* above Bahuerachic. Opposite the mine offices, and forming part of the great cliff, the rhyolite comes up again through the same fissure for a short distance, there being a break in the continuity of the dike between this point and the gulch below the village of Sierra. On the flanking ridge extending from the Lluvia mine toward El Chorro, is another rhyolite outcrop forming a sharp peak. Whatever the country rock of the mining camps of this part of the Sierra Madre, the presence of rhyolite dikes may be noted almost without exception, in fact, it is the only rock that may be considered as common to them all.

After the intrusion of the diabase, the area in question was elevated, causing a tension that fractured the superincumbent rocks, culminating on the west side in the profound fault which limits the uplifted area in that direction, and on the east side by a steep monocline, which dips under the Balojaqui *arroyo* and passes under Gloriapan mountain. The great fault on the west side may be traced from a point above the Fuerte river, northward along the foot of the high cliff near the Lluvia village, through the village of Sierra and thence to Bahuerachic *arroyo*, a distance of over six miles, the line of the fault beyond Sierra being marked by the conspicuous rhyolite dike spoken of above. The fault-scarp is plainly shown in the accompanying photograph (Fig. 3), the cliff being on the downthrow side of the fault.

While this appears strange, it may be explained by the extreme shattering of the rocks on the upthrow side, which, together with their elevation, caused them to be more easily disintegrated; the rocks on the other side, not being fractured and remaining at the normal elevation of the surrounding country, have resisted the tendency to erosion. The relation of this fault to the rocks on either side, may be seen in the accompanying section (Fig. 4), which represents one and a half miles in length, from northeast to southwest, through the Lluvia ridge.

The outcrop of the sedimentary beds consists of a nearly continuous cliff following the east side of the Lluvia ridge. It will be seen from the section, however, that the continuity of the beds is much disturbed by a number of minor faults that occur along the face of the cliff, these being most numerous in the neighborhood of the Lluvia de Oro mine, and graduating from shattered zones without any displacement, to faults of over 500 ft. These minor faults are roughly parallel to the great fault described above, having a general northwest to southeast direction.

As might be expected in such a disturbed region, the rocks in many places have undergone considerable alteration. Along the trail, directly on the top of the hill overlooking the Lluvia village, the limestone has been changed into a pure white marble. The most widely distributed product of alteration is epidote, which is scattered throughout the rock in patches from an inch in diameter up to several yards across. These areas of epidote are not confined to the limestone, but also occur in the eruptive rocks of the vicinity, although in lesser quantity than in the limestone. Patches of green garnet are also found, which are almost indistinguishable from the epidote. The most important alteration product, however, both in an economic sense and in the quantity of material involved, is the quartz of the region, which forms the matrix of the gold, constituting the orebodies of the district. All of the quartz bodies found up to this time and worthy of the name, have been confined to the limestone; stringers of quartz occur in the eruptive rock both above and below, but are altogether negligible with reference to their ore-bearing capacity.

As an ore deposit, Lluvia de Oro is most unusual. It is a metasomatic deposit of quartz within the limestone; the orebodies occurring in irregular lenses, which terminate abruptly, their long dimensions being transverse to the bedding planes of the limestone and roughly parallel to the fault-system of the district. Lead and zinc deposits in such form are common, but this is the only instance of a gold-quartz occurrence under such conditions that has ever come to my notice. The Mercur ore deposits consist of gold ore in limestone, but they form continuous bodies, occupying the contact between an intruded dike and the limestone, having little in common with the deposits of Lluvia de Oro, which I consider unique.

The fractures of some of the minor faults shown in the section were carefully examined as possibly favorable places for the deposition of ore, but no quartz was found along these planes. After examining a number of quartz exposures in the neighborhood, it was found that the mineralization occurred in zones of sheeting, where the limestone had been subjected to extensive fracturing, but without making any clean-cut fissure. The ore occurrence at Lluvia mine is undoubtedly in such a zone, and other outcrops of quartz were noted under similar conditions. The fracturing of the beds passes into the overlying eruptive, but the quartz bodies end before the limits of the limestone are reached, nothing but narrow stringers of comparatively barren quartz being visible in the superjacent rocks. Small stringers of quartz also occur in the diabase underneath the sedimentary rocks, but appeared to be absolutely barren. From these observations it would appear that the orebodies are to be sought in zones of fracture or sheeting in the limestone, the indications being decidedly unfavorable toward prospecting outside that formation.

The ore is a solid, gray, cherty quartz, containing fine black specks of mineral, with pyrite making its appearance sparingly in the deeper parts of the mine. Average assays from the lower orebody give results of 3 oz. gold, with 30 oz. silver, per ton. The ore near the surface ran much higher in gold, with a smaller proportion of silver. Up to the time of my visit, the milling process had been that of pure amalgamation, the tailing being stacked for future cyanidation. The company is now preparing for the installation of the latter process, which, together with a proposed increase in crushing capacity, will materially swell the production of the mine.

While the Lluvia de Oro mine is the only one in the district that is being profitably worked at present, there is no doubt that intelligent prospecting along the line of the limestone outcrop will succeed in developing other bodies of pay-ore, as the geological conditions are precisely the same; in fact, a small amount of rich ore was found on the claims of the Presidente Mining Co., five miles from the Lluvia mine. Systematic prospecting is going on at two points on the mineral belt, one at the northeast end by the Presidente Mining Co., a Milwaukee organization; another midway along the outcrop, by J. S. Towne, of the Campañia Metalurgica de San Luis Potosi, who is working two claims under bond.

Development of this region has been retarded by the existence of a prospecting concession, covering 900 square kilometers or 348 square miles, including the entire camp of Lluvia de Oro, together with much promising ground at other points. This concession gave the holders the

sole right to locate claims during the period of the concession, which was three years from September, 1903. This period, however, was extended six months, and should have expired in April, 1907.

Labor is fairly plentiful, at prices ranging from 1.50 to 2.50 *pesos* per day. Timber and boards are brought from the pine forest, eight miles north; wood for fuel being derived from the scrub oak that grows everywhere in the vicinity. The present mill is run by steam-power, but near-by the Fuerte river has considerable fall, which it is proposed to utilize in the generation of electric power to supply both mill and mine.

SIBERIAN COAL AND IRON.—Large deposits of anthracite coal have been discovered in the Russian territory of the Orenburg Cossacks. The depth is only 56 in., and the vein extends about 133 miles north and south, and at about the same distance in a southerly direction from the great Siberian railroad. The great value of this discovery lies in the following facts: (1) The proximity of the coalfields to the Ural iron and steel industry, which is at present mainly dependent upon wood and charcoal for fuel, and therefore otherwise incapable of further expansion. (2) In view of the probable early exhaustion of the South Russian iron ore mines, estimated to take place in about 30 years, the Ural district is destined to become the greatest producer of iron and steel in the Russian Empire; the above newly discovered coalfields will therefore become of inestimable value to the district. (3) The discovery in the neighborhood of the coalfields of deposits of brown hematite, an ore well adapted for smelting purposes.

MINERALS IN CHINA.—A report from Vice-Consul Rea Hanna, of Amoy, gives an American mining engineer's account of some mineral deposits in Fukien Province, China. It is stated that a mountain of magnetite iron ore a mile long and three-fourths of a mile wide exists near Amoy which is estimated to contain 10,850,000 short tons. Limestone, galena, kaolin, and zinc-blende deposits are also reported in the same neighborhood, while the natives bring in samples of rich antimony ore and graphite. The Consul adds that if the Chinese Government will enact mining laws which will make the investment of foreign capital and the introduction of foreign enterprise a possibility there appears to be a splendid field for American engineers and capitalists.

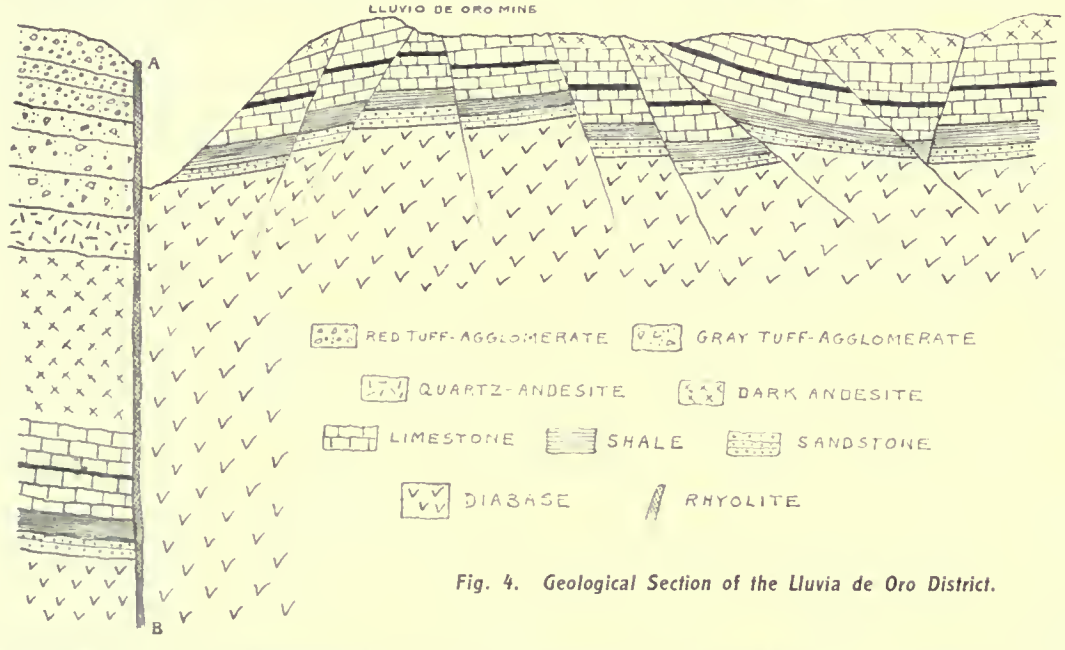


Fig. 4. Geological Section of the Lluvia de Oro District.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A piece of Basalt was sent by J. W. S., of Glendale, Oregon.

The specimen sent by C. W. E., of Ashland, Ore., is a Hydrocarbon.

The specimen sent by L. H. N., of Creede, Colo., has not been received.

A Shale carrying much organic matter was sent from Temascaltepec, Mex., by B. McD.

C. E. R., of Paris, Cal., sends a Tuff and vein Quartz stained with Iron. The quartz may carry gold, and should be assayed.

The two specimens sent from Greenwood, Cal., by L. E. L., are Andesite and Quartz, with Chalcopyrite. The latter might carry some gold.

R. W., of Joy, Utah, sends: No. 1, decomposed Andesite; No. 2, Andesite and vein Quartz; No. 3, Quartz; No. 4, weathered Diorite or Andesite; No. 5, Quartzite.

We could detect no platinum in the specimen sent by V. E. M., of Glendale, Ariz., and would hardly expect it to carry any. However, the only safe test is an assay.

The rocks sent by J. W. H., of Tonopah, are: No. 1, Andesite; No. 2, Andesite; No. 3, Andesite; No. 4, Rhyolite; No. 5, Andesite; No. 6, Diorite; No. 7, Andesite.

A piece of Quartz and grossularite Garnet carrying a seam of Galena, Chalcopyrite, and Sphalerite was sent by A. A., of Grizzly Flats, Cal. It should be assayed for gold and silver.

R. I. G., of Vernon, Nev., sends: No. 1, Basalt; No. 2, Basalt; No. 3, Basalt; No. 4, altered Andesite; No. 5, Basalt; No. 6, much weathered Diorite or Andesite; No. 7, altered Andesite, carrying amygdules of Quartz, Calcite, and Zeolites; No. 8, Opal and Chalcedony, stained with Copper and Iron; No. 9, Chert; No. 10, Quartz; No. 11, Dacite; No. 12, glassy Dacite; No. 13, glassy Dacite.

THE salt deposits of Michigan lie partly in strata of Silurian age and partly in those at the base of the Mississippian. The deposits which are worked are in the Saginaw and St. Clair valleys. The beds are of rock salt, but they are exploited by means of wells, the artificial brine from which is used directly in chemical works or is evaporated to dryness in a series of covered vats.

The Settling and Collection of Dust in Flues.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

In considering the principles applicable to the settling of dust accompanying the gases escaping from furnaces, we may apply those relating to the settling of sand and slime in water in settling-tanks.

To make a settling-tank as effective as possible, it must be traversed from entrance to exit by an entire current of uniform velocity throughout. To do this the water cannot flow into the tank as a downward-plunging stream, but should be passed down behind a perforated partition as

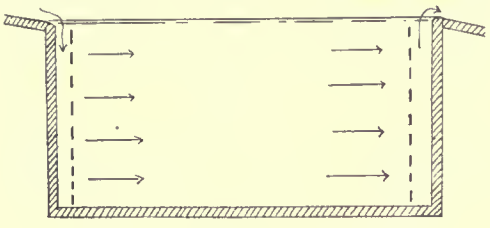


Fig. 1.

shown in Fig. 1, through which it issues in little jets or streams, which, widening, soon coalesce into a whole current, with the same velocity from top to bottom.

In regard to the settling rate of particles of mineral or dust through air, we know that the smaller the particle the slower it will settle, but the larger grains approach the theoretical velocity, $V = \sqrt{2gh}$. Fig. 2 shows the rate at which grains of the sizes specified have been found to fall through still air, the vertical distance traversed being 10 ft. Neglecting the resistance of the air, the grains should fall 10 ft. in 0.78 second, as represented by the asymptote XX. It will be noted that, according to the experiment, the finer grains would speedily fall from top to bottom of a horizontal flue 10 ft. high, and even for the finer dust, the time needed is short. The rate of fall in water is comparatively slow, and hence tanks should be large enough to give time for settlement. On the other hand, with flues or chambers, the fall being rapid, such flues may be shorter, providing the speed of the current has been sufficiently checked. In either case the path of the particle will be a diagonal, the component of the horizontally moving current and the velocity of fall in the fluid. Particles of from 100 to 200-mesh settle in from 2 to 4 seconds, with an average of 3 seconds, while those of less than 200-mesh fall in periods of 4 to 15 seconds, or even 25 seconds. When experimenting upon flue-dust from McDougall roasters the settling rate of the finest grains was 55 seconds. The finer flue-dust, near the stack, from the flue of a silver-lead smelting plant took 100 seconds to settle, and these latter observations were made in air fully illuminated by the sun. Beyond this, particles, even if carefully watched, disappeared from view. The most serious obstacle to the final settling of dust in the horizontally moving current of escaping gases is the inversion currents produced by it;

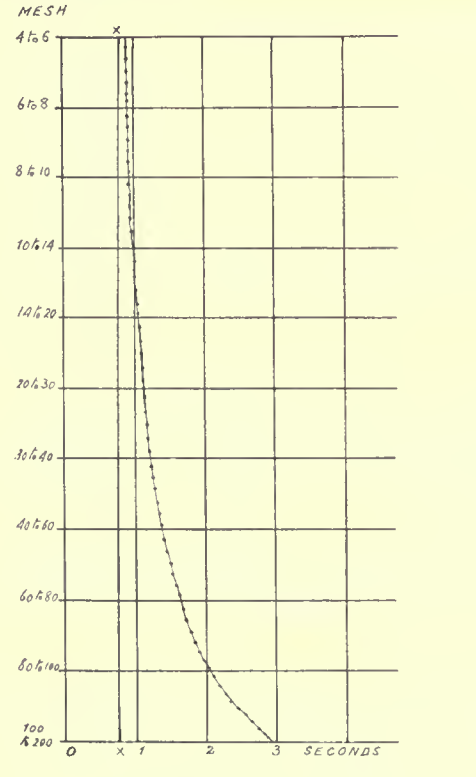


Fig. 2.

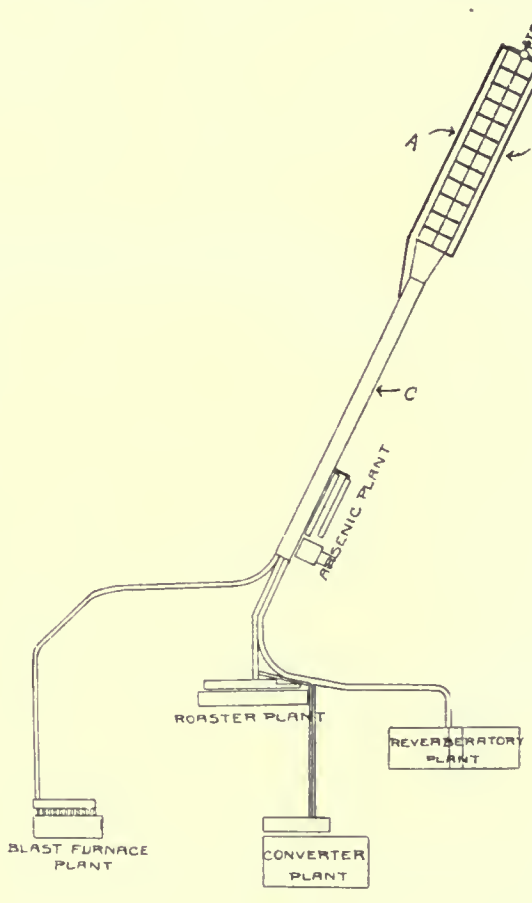


Fig. 3.

it creates eddies, which lift the finer ore particles, and so prevent their final settling.

As to relations of length and width in settling; let it be assumed for the purposes of discussion that we have a flue of a clear depth of 10 ft. with an additional 2½ ft. for the accumulation of dust, or 12½ ft. altogether. Let us then consider, with this depth, the length and width necessary for settling the dust-particles. We shall assume that we have a flue 120 ft. wide by 1,122 ft. long, as at the Washoe plant, Anaconda, also another 120 ft. long by 1,122 ft. wide, or in the latter case that the current is admitted all along the wall of the flue on one side and then, traversing it, escapes by openings in the opposite wall. This supposed flue is divided by cross-walls so that any division of it can be cut out and cleaned without disturbing or interrupting the flow in the rest of the system. Either of these flues has the same area (120 by 1,122 ft.), and if in each a perfect whole current exists, then the first will be the poorer, the second the better for settling the dust, because the faster the current, the more will the settling be disturbed by inversion currents or eddies. The calculated velocity in the flue 120 ft. wide is

3.47 ft. per second, and in the flue 1,122 ft. wide this would be reduced to one-ninth, or 0.38 ft. per second. A whole current at 0.38 ft. per second would settle the finest dust from the McDougall roaster in a distance of 21 ft. and the flue dust from the silver-lead furnace in 38 ft. The inversion currents would be strong in the narrower flue and almost absent in the wide one, the latter being in this respect superior. To get the best result, however, we must have a perfect whole-current feed, and a perfect whole-current discharge. It would probably be done by making numerous perforations through the entering and exit walls, with baffles; and these perforations would have to be adjusted by careful observation with a delicate anemometer. The gases passing into the exit-flue (*B* Fig. 3) would contain but little dust, and would seldom need to be cleaned out. The heavier flue-dust will have been settled out in the lower, 60 ft. of flue *C*, and hence there would be but little caught in the narrower entrance-flue *A*. It is quite possible that the gases in *B* would drop (by condensation) the remaining arsenic that they contain, giving a special product rich in that metal.

The material of which the flue is constructed should be, in copper practice at least, of an acid-resistant nature. In silver-lead practice more sheet-steel can be used, particularly for the hopper-bottoms of the flues. Finally, such a flue should be designed to dispose of storm-water, and it may well be low and covering a large area. The bottom of the flue should be smooth and unobstructed, so that eddies may not be created. We have an analogous phenemenon in placer mining, where, if the bottoms of the sluices are rough, they cause a good deal of 'boiling,' which interferes with the settling of the gold.

EARTHQUAKES.—Dana, in the fourth edition of his Manual of Geology, published in 1895, called attention to the fact that two great systems of courses, or trends, prevail over the world—a northwestern and a northeastern, transverse to one another. He also showed that the islands of the Pacific ocean were adapted to the northwest trends. I can now, in the light of my later studies of the Mexican plateau and the West Indian islands, suggest a continuation of these curving northwesterly trends throughout the coast ranges of California and the Mexican plateau, Central America, and the Great Antilles, crossing the older northeastern trends of the Appalachian and the northern trends of the Laramide, or Rocky Mountain system.

It is also possible now to speculate upon the proposition that the axial trend of the mountain-making movements of the continent, which dominate all of our great physical features, has progressively swerved from northeastward, through north, to a northwestward direction, in which latter direction lies the present zone of stresses and corrugations, following a course around the globe more concentric with the pole than radial from it. The great stresses of the San Francisco and Jamaica earthquakes, apparently, are manifestations of a recent series of stresses along this later northwest zone.—Robert T. Hill.

THE principal fluorspar-producing deposits of the country are in Caldwell, Livingston, and Crittenden counties, Kentucky, and Hardin and Pope counties, Illinois, though there have been reports of valuable prospects in neighboring counties. Colorado has begun to be an important producer, and a small, but increasing production is reported from western Tennessee. Arizona, which has reported the production of varying quantities of fluorspar in recent years, has dropped out of the producing list, assessment work being all that was done upon the prospects there.

Letters of a Self-Made Miner to His New Foreman.—III.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

My dear Tom:

You have obtained good men. You have placed them intelligently. The next important thing to do is to keep them. And to keep good men you must treat them right. Some persons, if told this, would think that to treat the men right you must let them do just as they please. But to raise children without any restrictions is the sure way to spoil them, and "men are but children of a larger growth."

I am a strong believer in discipline. I shall have suggestions to make to you from time to time, and I shall expect you to see them carried out without my having to make the same suggestion twice. I wish you to train the men under you to see your wishes carried out in the same way.

A good teamster doesn't push on the lines, nor does he give them a hard pull. He holds them just so each horse is exactly where he ought to be. He seldom uses the whip. One word and every horse steps forward into the collar. To make a good foreman, you must have the whip in your hand, but your men must feel that you will never use it except for cause. Some foremen think that they must fire a man occasionally to keep the men in condition of apprehension as to what may happen to them. If one of your men is obstreperous, have the tact to take him aside and impress him with the necessity of his pulling in line as you wish. If he doesn't comply, give him his time.

Your men must be well fed. There have been times in my life when I was short on provisions, but seldom a time when I was short on appetite. I know that when a man works as he ought to work in a mine, he wants something good to eat, and plenty of it. We have a boarding-house under contract to furnish us the best of meals. This will not be under your supervision; but, if there is any complaint, or you can make any suggestions for betterment of the service, you will please let me know.

Next in importance to good food is good air. No man can do justice to himself in foul air. You will take particular pains to see that all places are well ventilated. And you will protect your men from the other extreme, so no one will have to work in an unnecessarily strong draft.

I wish you to counsel with your men. You may not need to learn from them, though you will never have a man on the force from whom you may not learn something; but you pay a man a delicate, high compliment when you ask his advice, and you preclude the possibility of his getting the idea that you think you know it all. When a foreman creates the impression among his men that he thinks the sum of all knowledge is concentrated in the territory beneath his hat band, his days of usefulness are at an end. Again, and above all else, in counseling with those under you, you are helping them—you are training them to think for themselves; and the valuable employee is the one who puts thought behind his muscle.

With your practical knowledge of mining, you will find many an occasion to make valuable suggestions to those under you, and these made in the right spirit always have a good influence. Thus, in making your rounds, you may find a man making a drive in hard ground. He has gouged in 18 inches or more, and is ready to break to the gouge. Encourage him to carry

the gouge in farther, if he puts in a day at it. He might hesitate to do it without your encouragement, through fear that you might think he was not accomplishing anything. But explain to him that he will gain by it; that if ground is tight the breaking holes will have a better chance; that oftentimes ground will slab off beyond the end of the holes. When the man follows your advice and sees good results, he will feel grateful that he is working under a boss who knows something.

I wish you to be a source of encouragement and inspiration to your men. You will go into an end some day and find a man in hard ground. If you are as bright as I think you are, you will not wait to have your attention called to it. You will speak of it first. You may make some such remark as: "That's tight ground, but there's one satisfaction, I have a man up against it who's good for it." Or, perhaps, you may say: "Several of the men are in hard ground this week." After you have passed on, the man will pound the drill with more vigor as he says to himself: "The boss is all right. He knows how it is. He's been there himself."

Occasionally a man will be put at work where for the first few days he will make a very poor showing. I was a visitor at a mine one time, and among the men put on one afternoon was one who worked hard, and at night had only succeeded in getting in one short upper. Things had gone hard with him from start to finish. His muscles were not hardened, the hammer didn't swing just right, some of the drills didn't follow, he noticed the boss was keeping close tab on him, and that flustrated him. At night he was sore and discouraged, and knowing he had not done justice to himself he expected to be fired; so he called for his time. Had such a man been working for me I would have tided him over the period of discouragement. I would have pointed out the things that had operated to make him feel blue, had told him that I had watched him critically, had noticed that he had an easy steady movement in his work, and was satisfied that he would make a good workman for me. If a man works by jerks let him go, but if he is a plodder, if he takes his hammer and pounds away with regularity and persistence, no matter how slow he may appear to be, no matter how hard it may seem to get an idea into his head and to get him to do some things as you are accustomed to having them done, be patient. Once you get such a man trained he goes ahead with the regularity of a clock.

A word of appreciation at the right time is worth a great deal. If a man has done fine work for you let him know that you know it. On the contrary, if a man isn't doing as well as you think he should, don't scold or find fault. A good plan is to say to such an one: "You are doing very fairly, but I think you can do better," and then point out to him how he can improve his way of doing things.

You will have some men who will deliver a round of oaths when anything goes wrong. I have watched the effect, and it always seemed to me that the swearing didn't remedy the matter, that something else had to be done, and that the energy expended in unloading the oaths might be put to a better purpose. Swearing is not a good accomplishment for a foreman. He should have perfect control of himself in every situation.

I would say avoid making a chum of any man under you. Some of the men would be certain to think he was a favorite, and would get all the soft snaps. You should aim to treat all your men alike, and avoid even the appearance of favoritism.

You will think I am very strict, that I am requiring a great deal, that a man can't be expected to remember all these things. All you have to do is to take for yourself a motto ascribed to George Washington: "Never forget that you are a gentleman." All I have said is embodied in that. Have consideration for your men and they will appreciate it. Only occasionally will you find a man who has been raised to expect a certain amount of domineering in a boss, and who thinks kind treatment a sign of weakness. Let him go. The good words that others will speak for you will bring dozens who will want to take his place.

Sincerely yours,

TIMOTHY STRONG.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Possession for the statutory period does not relieve the possessor from doing the annual assessment work required by the United States statutes, and upon failure to do such work in any one year, the land becomes subject to re-location, notwithstanding he may have occupied it for more than the statutory period preceding any re-location. And such possession and working for the statutory period, when proved in the Land Office, or before the courts, gives the possessor the status of a valid locator. But it is said that testimony to prove such possession is immaterial, where the party offering it claimed under a location duly made pursuant to law, and there was no issue as to the original validity of such location, but the question being simply as to whether he had forfeited it by failure to do the annual assessment for a given year.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

A failure to comply substantially with the statute requiring the locator of a mining claim to post a location notice in some conspicuous place on the location, renders the location void. But the mere fact that the portion of the claim upon which such notice was posted by mistake overlapped or conflicted with the previous existing claim, was held not sufficient to invalidate the location. The location was held to be good as to so much of the claim not in conflict.

Upton *v.* Santa Rita Min. Co., (N. Mex.) 89 Pac. 275. (Feb. '07).

The statute permitting the filing of an additional or amended declaratory statement of the location of a mining claim where the locator has reason to believe that his original certificate is defective, or that the legal requirements have not been complied with, relates back to the date of the original location, in the absence of any intervening rights. And where the name given for a mining claim in the original declaratory statement was Annex, and in the amended declaratory statement the name given was Annex-Plumber, and the amended statement referred to the Annex location and declared that it was intended as an amended statement of the Annex claim, the amended statement was held not defective by reason of the word Plumber.

Butte Consol. Min. Co. *v.* Barker (Mont.), 89, Pac. 302 (March, '07).

In an action to recover the amount paid for mining claims on the ground that they were never legally located, the question whether there had been a discovery of a vein or lode within the limits of the claim as required by the act of Congress before its location, was held to be one of fact for the jury.

Whitney *v.* Haskell (Pa.) 66 Atl. 101 (Jan., '07).

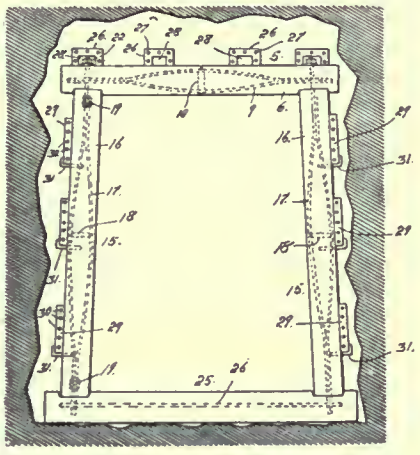
There is held to be an implied covenant for good title and peaceable and quiet possession in a lease for years for oil and gas, and such implied covenant of warranty is not limited to the right of expiration for oil and gas, but when produced the right to the amount stipulated for in the lease is likewise thereby protected.

Kilcoyne *v.* Southern Oil Co. (W. Va.), 56 S. E. 88 (March, '07).

MINING AND METALLURGICAL PATENTS.

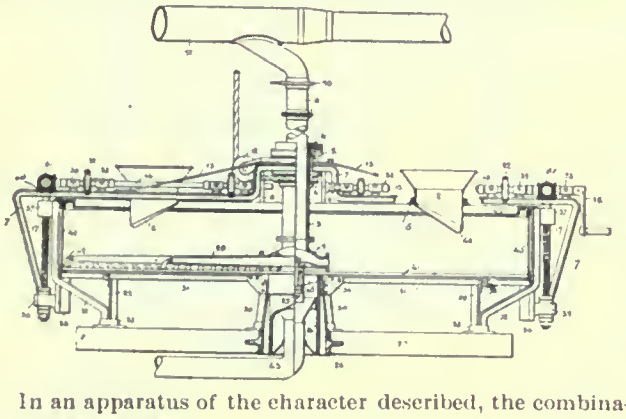
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ARTIFICIAL TIMBERING FOR MINE-TUNNELS.—No. 851,629; Darwin W. Shepard, Denver, Colorado.



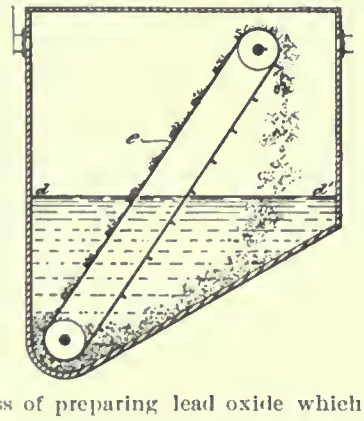
A timbering structure for mines including a frame work composed of top beams and uprights at the extremities of the top beams, the body portion of each beam of the structure being composed of artificial stone in which are embedded metal members bowed outwardly between their extremities in the direction of the strain to which they are to be subjected.

CONCENTRATOR.—No. 851,426; Henry L. Lightner, San Francisco, Cal., assignor of one-third to William Priest and one-third to Henry Felge, San Francisco, California.



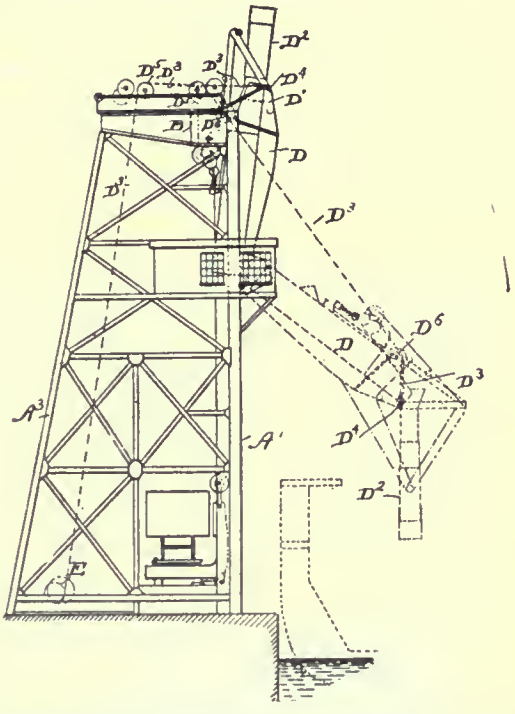
In an apparatus of the character described, the combination of a vat having a central hole in the bottom thereof, means for feeding at the periphery of the vat the material to be treated, revoluble hollow arms, and nozzles connected therewith, discharging over the surface of the material in the vat inwardly or away from said periphery, means for supplying compressed air to said arms, means for revolving said arms, and means for raising said arms relatively to the vat.

PROCESS OF MAKING LEAD OXIDE.—No. 852,325; Clarence A. Hall, Philadelphia, Pennsylvania.



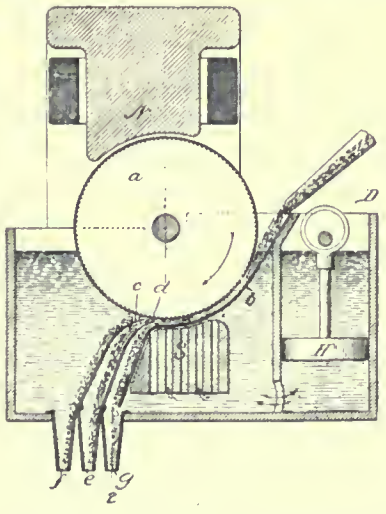
The process of preparing lead oxide which consists in causing a body of comminuted water wet lead to repeatedly pass as a shower through a changing body of air under pressure to induce oxidation, repeatedly plunging the showers of lead particles into a body of water, thereby detaching the oxide and exposing fresh surfaces of the lead particles for further oxidation, and repeating the foregoing steps until substantially all the lead is oxidized.

CAR-DUMPING APPARATUS.—No. 851,014; Frederick W. Lovell, Cleveland, Ohio, assignor to the McMyler Manufacturing Company, Cleveland, Ohio, a Corporation of Ohio.



In combination a tower and a dumping-apron pivotally supported at one side of the tower and having hoisting-ropes, a forward transverse girder carrying supports for sheaves for the hoisting-ropes of the apron, said girder being set back of the vertical plane of the points of pivotal support of the apron so as to afford a clear space above said points of support into which clear space a portion of the apron may be drawn.

MAGNETIC ORE-SEPARATOR.—No. 851,046; Henry H. Wait, Chicago, Ill., assignor to International Separator Company, Chicago, Ill., a Corporation of New Jersey.



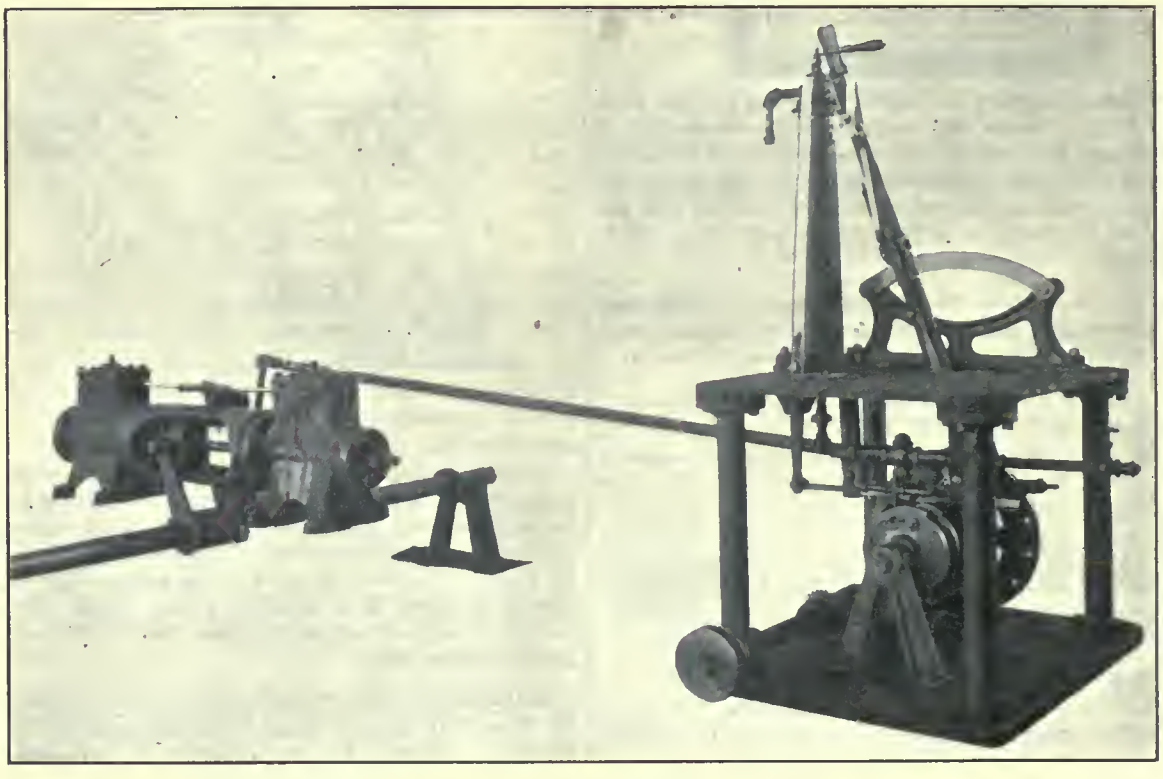
In an ore-concentrator, the combination with a revolving magnetic cylinder having means for causing flux dispersions at its periphery, of a magnet-pole below said cylinder, a support forming a passage-way between said cylinder and magnet-pole for the materials to be separated, a divider for separating the attracted from the non-attracted materials, a vessel adapted to contain a fluid medium surrounding the operation portion of the cylinder, and means for imparting a vibratory motion to said fluid medium.

The Nicholson Engine-Stop.

This is a device for use on link-reversing winding engines. The illustration shows the lever forward and valves full open, and the tappet-roller is ready to push lever to middle position for final cut-off on the engine-valves. This also operates on the steam-valve for applying the brake. The reverse lever can be set for backward motion, and by reversing the engines, this also reverses the motion of the machine. When the reverse lever is brought to the centre of the reverse-quadrant and the engine-valves are centred, the lever can only be operated in the opposite direction; but if it is desired to go a little farther up, this can be done by giving the reverse-lever a little extra pull or push, thus compressing the spring. This will allow a slight opening of the valves and the expansion of the spring, with the disc revolving in the same direction, will act quickly on the lever again and bring the main valves central over the steam-ports. When the stop begins to act, the lever begins to move forward or backward. The engineer usually has his hand on the lever in regular hoisting; when the lever begins to move, he has positive warning that the cage is approaching the end of hoist or prearranged distance. If he fails for any reason, the machine will centre the valves and apply the brake. If hoisting is done from more than one level, one drum is usually made loose and driven by a clutch, and the other keyed fast. For this work a double machine is used. One side is driven from the tight drum, the other from the loose drum. Any change for different levels makes a like change in the machine automatically, thus eliminating any chance of failure on the part of the engineer for adjusting the stop for the required hoist. Tests were made with the Nicholson engine-stop installed on two pairs of 24 + 48 in. first-motion engines, each with conical drums 8 to 10 ft. diam. with a hoisting speed of 1,680 ft. per min. with a dead load of 5,000 lb. coal, cages, and car in balance. On one of these pairs of engines hoisting into curved guides where self-dumping cages are used, the engine-stop was set to hold the cage at the entrance to the curved guides where it is set to stop each hoist. The engineer manipulates a special valve to the dumping point of the curved guides until the car has tilted at an angle of 37½°, dumping into a chute conveying the coal into the bins. In this case, where self-dumpers are used, the car is not taken from the cage, only at the bottom of the shaft. Ordinarily great care must be taken by the engineer when pulling into the guides.

The other pair of engines, of the same size and with the same load, was worked under a different condition. The cages were hoisted above the landing, the car being pushed off for dumping. The lift in this case was 367 ft.; the hoist was made in 13 seconds; rope speed 1,680 ft.; load, 5,000 lb. Trials were made in the shaft; the engine-stop operating on the main valve alone, showing a distance of 62 ft. traveled after the beginning of cut-off. Trials were made with both brake and cut-off applied, showing a variation of 16 in., both proving entirely satisfactory. The tests were emergency trials, and to prove that the stop would take care of a runaway cage. The trials also proved the stop would not interfere with the output of the mine; the time allowed for hoisting was 15 sec., time of test hoisting 13 seconds.

There are numerous devices for stopping hoisting engines all at fixed distances above the top landing, consequently when the ascending cage passes the landing at the surface, the descending cage strikes the bottom with full velocity, and causes more damage at the bottom than at the top. This was the case at the Auchincloss colliery of the D. L. & W. railroad, which happened over a year ago, when ten men were killed on account of the descending cage crashing through the landing fans set to receive the cage and the ascending cage pulled over the sheaves. This Nicholson engine-stop has been applied to engines built by the Vulcan Iron Works of Wilkes-Barre, Pa., ranging in size 42 + 30 in. diam., 60 in. stroke with drums 12 ft. diam. for hoisting water and coal, also on 24 + 48 in. engines with double-cone drums 8 to 10 ft. diam. It is obvious in these days of high rope-speed and increased steam-pressure, that some protection must be given the operators and engineer for the prevention of the many fatal and expensive accidents happening from overwinding through some slight error on the part of the engineer or a faulty throttle. There are cases where a speed limit is required in hoisting, and provision has been made whereby the speed is checked automatically when the increased speed limit is reached, allowing the engines automatically to resume their normal speed. This device is particularly desirable where hoisting water. The machine is simple and effective, and does daily just what is claimed for it under the various conditions of hoisting.



The Nicholson Engine-Stop.

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Editorial.

IN OUR ISSUE of February 16, comment was made in response to a subscriber's inquiry as to the right of a junior locator whose claim overlapped a senior claim to acquire by mere gravity the area in conflict upon the failure of the senior to perform the annual assessment work. It was there observed that prior to the decision of the United States Supreme Court in the Lavagnino-Uhlig case, the rule had obtained that the junior locator could not secure title to the area conflicting with the senior without re-locating after the lapse of the year upon the failure of the senior to perform the necessary work, and that in its decision in the Lavagnino-Uhlig case the Court had, without in any way referring to or commenting on its former rulings, practically reversed itself. This last expression of that august tribunal has disturbed the equilibrium of both bench and bar in the mining regions. As a further contribution to the literature on the subject there appears in another column of this issue a communication from Mr. Henry M. Hoyt, 2nd, a well-known lawyer of the Nome bar. We feel confident that Mr. Hoyt's logical presentation of this perplexing situation will be of interest, not only to mining lawyers and engineers, but to many of our subscribers who keep in close touch with the evolutionary development of our somewhat complex mining laws.

OUR LONDON CORRESPONDENT refers to the world-wide interest of Americans in mining and defends himself from the charge of giving too much space to Siberian operations. Having regard to the fact that such representative American mining engineers as T. H. Leggett, C. M. Rolker, and H. A. Titcomb have been called upon lately to examine mines in Siberia, two of them being there now or else on their way, it does seem incorrect to look upon the interest in Siberian mining as merely local. Moreover, W. A. Heywood, formerly in Tennessee, and H. E. West, lately in Mexico, have gone to Siberia recently and a large number of English engineers (such as Pellew Harvey & Fell, and Arthur L. Pearse) are engaged in the development of enterprises in that country. Some of the readers of this paper must necessarily be interested in the subject. But the humor of the particular protest made by our friend Mr. C. W. Purington is that he himself has been since engaged to undertake professional work in Siberia, a region with which he made a geological acquaintance several years ago.

GUANAJUATO AND PACHUCA are seeing rapid advance in cyanidation, and the passing of the *patio* process. At Pachuca excellent results have been obtained by Mr. A. Grothe in his new plant, consisting

of five conical-bottom vats 40 feet high and 15 feet diameter, in which sand and slime are agitated by air. Six horse-power suffices to agitate 100 tons of ore. The extraction is rapid. The cyanide-plant of the Hacienda San Francisco has been in operation six weeks and so successfully that plans are being drawn for changing several pan-mills to cyanide-plants. The owners of the San Rafael mine are about to add 20 stamps to the 40 already at work, using three tube-mills for re-grinding. The pulp will be crushed in solution and will then be agitated by compressed air in both of the vats. Butters filters are to be employed for treating the residue. At Guanajuato there is similar activity. A 1,000-ton plant is assured for the La Luz mines, many of whose stockholders are mining engineers of repute. The plans call for 320 stamps, concentrators, re-grinding machinery, and a cyanide annex. Machinery for a 60-stamp mill and cyanide-plant is reported to have been ordered for the Tajo de Dolores mine. We are glad to give this news. The encroachment of modern practice upon the historic precincts of Mexican mining is one of the most interesting in the advance of technical science.

Industrial Efficiency.

ON the page opposite we quote a suggestive explanation of England's lack of success in the industrial competition of the present day, as compared to Germany and America. The point is made that England is a nation at play, looking upon work as a necessary evil and games as the real purpose of life. It is amusement mad, not dissipated. In contrast, the systematic effort of Germany and the individual energy of the American in business are emphasized. And it is largely true, as true as such broad statements can be. Nor need we dwell upon the conditions that have made the American industrially more efficient than his contemporaries; there are good reasons why he should be so; he represents, by descent or as an immigrant, the more enterprising and restless spirit of Europe; he has had, and he has still, the great stimulus that comes to those that are engaged in developing a continent; he has freedom of opportunity and equality before the law; some of the last may be a fiction in these days of organized monopoly, but even the idea of equality of opportunity has fired the imagination of many a good man. However these things be, we have the undoubted result, as Dr. Arthur Shadwell says, that the American is industrially most efficient and successful. But we shall not dwell on that; the question we ask is whether the price paid has not been too high. Take our own profession, that of mining and metallurgical engineers. Are the Americans ahead? Yes. Why? Because they apply to their work the same concentration of purpose and sustained effort that they do to football. They make a business of their profession, as of their games. For that reason the games are destroyed as sport and for the same reason they are apt to gain success in their profession at the expense of everthing else. The Englishman stops work at five o'clock and plays golf or tennis; the German drinks beer and listens to music; the American is still working. He works at night, he talks shop at his meals, he ruminates on machinery and mines in his sleep. His intensity is splendid. Now the Englishman's tennis and golf, and the German's beer and music, are well enough in their way, but to think tennis and golf, or dream beer and music, during hours not properly assignable to them is a handicap, as against the man who puts them aside and devotes himself unreservedly to the work of his life. Of course, we exaggerate; that is necessary to illustrate the point, the inference from which is this: That while England is a nation at play, shirking business for the sake of amusement, the American people give to business what was meant for happiness; they sacrifice too much to industrial success. A life of grasping and grinding is not worth while, the forces of acquisition and brute trading do not tend to moral or intellectual progress, the aim of science should be higher than to make cheap iron, the main purpose of education should not be the gaining of a big salary. The fact is the American imagination is obsessed by the spectacle of Rockefeller, Pierpont Morgan, Harriman, and a dozen other enormously rich men, who represent the fine flower or the poisonous growth, as you will, of money-making. The Englishman takes more interest in the winning cricket eleven or the champion oarsmen, putting them on a pinnacle of fame higher than the millionaires of the moment. Is there not room for something between the two, for attention to work associated with a certain amount of healthy exercise, civic duty, domestic happiness, and personal culture? Commercial industrialism is over-rated, the whole happiness of man is not in it, and if it be the one god of our idolatry, then this great country, the greatest in the history of mankind, will be but a gigantic futility.

FROM BUTTE comes the story that the richest ore ever found in that district has been discovered in the Receiver mine and that the ore contains 94.2 per cent copper. Then, as if to silence the criticism of the timid mineralogist, we are informed that "the Receiver ore, of which there was, of course, only a small quantity found assaying 94.2 per cent, is the kind of thing that makes scientists, experts, and accepted authorities change their rules and revise their works." But why the "of course"? If there be "a small quantity" of stuff such as no scientific man ever saw or dreamed of, why should there not be a mountain of it? When you go to work to confuse scientists and experts, why not do it thoroughly? Next to native copper, the richest copper mineral is cuprite, containing 88.8 per cent; then comes chalcocite, with 79.8 per cent. At least that was the general supposition until the scribes of Butte discovered this new mineral, in order to prove the ignorance of the authorities in mineralogy. We hope that the Butte mines, and especially those of the Continental district, will produce lots of it, whatever it may be, even if we find that it assays more nearly 64 per cent than 94. It will indicate some respect for the feelings of scientists and experts if the percentage could be "revised" rather than Dana, Rutley, or Miers.

By the Way.

In a recently published book by Dr. Arthur Shadwell, we find the following instructive passage on industrial efficiency:

The American method of work in the industrial sphere is distinguished by the following features: Enterprise, audacity, push, restlessness, eagerness for novelty, inventiveness, emulation, and cupidity. Employers and employed have exhibited the same in their degree. The manufacturer aims at extending his business, he takes up novelties, encourages invention, studies the market, tries devices to increase output and diminish cost. Hence, for instance, the standardization of products, the organization of the workshops, the demand for highly educated officers, and the alert control exercised by large combinations, which enable a central authority to check the management of each component by the results of the rest, and to screw up any that are growing slack. The employed are eager to earn as much as possible and to better themselves. Both are absorbed in their occupation, and bend all their energies to it. I do not mean to say that all these qualities are invariably present; I have shown that in some trades and centres they have been conspicuously absent. But they are the distinctive qualities and methods that have won success; and broadly speaking, they have been exercised without either help, save the tariff, or hindrance from outside. The industrial expansion of Germany presents another picture. It has been achieved by equally hard work, but the adventurous audacity and restless search for novelty of America have been replaced by steady and watchful effort. The circumstances of the country, not less than the national character, have imposed this difference. But there is another, not less striking, to which every subject handled in this book bears witness. The industrial population has not been left to carve out its own destiny, but has been guided and helped at every step. All sections of the community, from the throne to the workhouse, have contributed something. *Laissez faire*, or *Manchesterthum*, as they say in Germany, is dead; ordered regulation is accepted and applied with infinite pains by the legislature, Government departments, municipalities, and private citizens. It is seen not only in the scientific tariff but in the careful and judicious factory code, the State system of insurance, the organization of traffic and transport by railway and canal, the fostering of the mercantile marine, the educational provision, municipal action and poor-law administration. So the edifice has been built up four-square and buttressed about on either side. It is a wonderful achievement, in which every unit has played a part, and the spirit which has brought it about is the spirit of duty and work. * * * England is like a composite photograph, in which two likenesses are blurred into one. It shows traces of American enterprise and of German order; but the enterprise is faded and the order muddled. They combine a curious travesty in which activity and perseverence assume the expression of ease and indolence. The once enterprising manufacturer has grown slack; he has let the business take care of itself, while he is shooting grouse or yachting in the Mediterranean. That is *his* business. The once unequalled workman has adopted the motto, 'Get as much and do as little as possible;' *his* business is football or betting. Each blames the other. * * * Then the manufacturer complains of being handicapped in various ways; and he is justified. He is handicapped by laws and by-laws and obsolete regulations, which have the effect of hindering him in some respects without any set-off in the way of help. And what do all these mean but carelessness and neglect on some one's part? Legislators who pass laws without taking the trouble to ascertain the facts, or understand what they are doing, or who fail to alter obsolete and detrimental ones, such as the patent laws and the tax on industrial alcohol; Government departments too indolent to watch events and adapt regulations to changing conditions; local authorities applying by-laws without discretion, piling up rates without thought and administering the poor-law without care; everybody bent on pleasure and amusement. That is the universal business. No one is in a position to abuse the rest; they are all in the picture, and wear the same expression from top to bottom of the social scale. Not every individual, of course, but every class. We are a nation at play. Work is a nuisance, an evil necessity to be shirked and hurried over as quickly and easily as possible in order that we may get away to the real business of life—the golf course, the bridge table, the cricket and football field, or some other of the thousand amusements which occupy our minds, and for which no trouble is too great.

THE American possesses in great degree the ability to make a living. But he possesses in a slight degree only the ability of using his leisure hours with pleasure. In short, we have not developed the art of living but have developed the business of making a living. To make a young man an artisan is all right. But public opinion should do better. It should show him how to relax and to play. There has been a vast improvement in this. The diversification of industry and the development of machinery has reduced the minimum working day to eight hours. But the other hours are often foolishly spent. If each working family possessed a home with a small acreage devoted to extensive farming and with a poultry yard and a few live stock, the increase in the productivity of the United States would be enormous. This is one way to increase the efficiency of happiness throughout our land. A person's happiness is like the amperes of Ohm's law, his means of satisfying his desires divided by his wants. The current flow of pleasure should be increased by increasing in a rational manner the natural means rather than by decreasing the wants. With all our national wealth and greatness there is some foolishness about the lives of rich and poor save in isolated rare individuals. How to cultivate repose and to relax and divert the streams of energy in other lines—the proper balance between one's powers and his task, the proper distribution between one's physical, intellectual, and spiritual faculties, is the greatest question of anthropology.—*Electrochemical and Metallurgical Industry.*

THE practical worker should interest himself in fundamental principles with the object of inducing himself to improve and develop the processes upon which he is working, and should therefore look into discussions which at first appear to have too theoretical a character. Everyone who tries to improve, acts on a theory of some sort, though not always conscious of it, and upon the soundness of this theory success largely depends. A knowledge of theoretical principles is therefore beneficial, if only in conducing to prevent fallacious reasoning. The technical man in charge of reduction works is constantly called on to decide on the adoption, or otherwise, of a so-called improvement, and in order to be able to discriminate successfully between the real and the apparent, it is necessary to use sound reasoning based upon theoretical principles and upon practical experience. For, to make an alteration without investigating the reason which leads up to it, is but little short of gambling; or to adopt a so-called improvement, only because it has been successfully used elsewhere, points to incompetency.

Personal.

CLAUDE VAUTIN is at Santiago, Chile.

JAMES W. MALCOLMSON is at Mexico City.

FRANK J. BOOTH is at Paso Robles, California.

R. S. BOTSFORD is at Cruz del Eje in the Argentine.

HERBERT J. DALY has arrived in London from Melbourne.

H. R. PLATE has left Denver on his return to Ely, Nevada.

W. C. PATERSON has returned to Mogollon, New Mexico, from Denver.

JAMES W. NEILL has been examining mines near Prescott, Arizona.

R. GILMAN BROWN is expected in San Francisco some time in June.

M. B. HOLT has returned to Silverton, Colo., after a short visit to Denver.

W. S. KEITH, lately of San Francisco, is in charge of the smelter at Sumpter, Oregon.

LEON M. HALL returned this week to San Francisco from Virginia City, Nevada.

JOHN H. MARKS has returned to Denver from Goldfield and other camps in Nevada.

IRA C. BOSS has returned to San Francisco from New York. He will remain here.

NORMAN DANVERS POWER arrived on the *Mongolia*, on his way from Australia to England.

C. D. WHYTE, recently from Scotland, is at the Bonanza King mine, in Trinity county, California.

H. VINCENT WALLACE is in Otero county, New Mexico, making an examination of a copper mine.

ALGERNON DEL MAR is manager for the United Colorado Mines Co., in Gunnison county, Colorado.

GEORGE J. BANCROFT has completed an examination of the Stratton's Independence mine at Cripple Creek.

E. H. MESSITER has left New York on a business trip that will cover Utah, Colorado, Arizona, and Texas.

C. W. PURINGTON is on his way from London to Vladivostock, to examine dredging ground in Eastern Siberia.

MARTIN SCHWERIN has returned to New York from the examination of mines in the San Carlos district, Arizona.

W. A. CARLYLE has resigned as general manager of the Rio Tinto mines, to undertake consulting work at London.

ROBERT B. LAMB, of Hedley, B. C., is consulting engineer to the Barnes-King Mining Co., at Kendall, Montana.

EDWARD S. WIARD is mill superintendent for the Tecolotes Mining Co., in the Santa Barbara district, Chihuahua, Mexico.

H. BINNIE, a mine-owner from Sydney, N. S. W., is visiting San Francisco on his way to see the mines of the Cœur d'Alene.

EDWARD W. RALPH has been appointed general superintendent for the Boston-Ely Development Co., at Kimberly, Nevada.

VICTOR G. HILLS of Hills & Willis, Cripple Creek and Denver, is making mine examinations in the San Juan region, near Silverton, Colorado.

GEORGE A. PACKARD has returned to Wakefield, Mass., having finished his temporary work as head of the metallurgical department in the School of Mines, at Rolla, Missouri.

CORRIDON H. PUTNAM has returned to Prescott, Ariz., from New York and Denver, where he has been getting estimates on a plant of machinery for his property near Jerome.

CLIFFORD G. DENNIS, manager of the Marfa and Mariposa mines at Terlingua, Texas, has resigned to accept a like position with the Colonial Mining Co., at Ehrenberg, in Arizona.

Latest Market Reports.

LOCAL METAL PRICES—May 29.

Antimony	26.25@29.25c	Quicksilver (flask)	$38@39.50
Copper	26.25@27.25c	Spelter	7.75@ 8.50c
Pig Lead	6.10@ 7.05c	Tin	43.25@44.75c

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
May 24	23¾	6	6⅜	67
" 25	23¾	6	6⅜	67
" 26	Sunday.	No market.		
" 27	23¾	6	6⅜	67¼
" 28	24¾	6	6⅜	67½
" 29	23⅞	6	6⅜	67⅜
" 30	Decoration Day.	No market.		

ANGLO-AMERICAN SHARES.
Cabled from London.

	May 23 £ s. d.	May 29. £ s. d.
Camp Bird	1 2 6	1 1 9
El Oro	1 5 9	1 3 6
Esperanza	1 10 0	1 8 9
Dolores	1 12 6	1 8 9
Oroville Dredging	0 17 3	0 16 3
Stratton's Independence	0 3 3	0 3 0
Tomboy	1 18 0	1 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices May 23.	May 29.
Bingham Central	1¼	1¼
Boston Copper	25⅞	26⅜
Calumet & Arizona	167	164
Cumberland Ely	8¼	8
Dolores	7	7¼
El Rayo	5⅛	5⅜
Guanajuato Con	4	3¾
Giroux Con	9⅛	8¾
Greene Con	22½	22
Nevada Con	13¼	13¾
Nipissing	11⅛	1⅞
Tennessee Copper	37	36½
Tonopah Ex	1¾	2
Tonopah-Belmont	3¾	4
Tonopah	15⅝	15⅝
United Copper	58	58¼
Utah Copper	26½	25½

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, May 29.

Atlanta	$ 56	Laguna	1.15*
Belmont	3.45	Little Tonopah	.....
Columbia Mtn	48	Manhattan Con	.....
Combination Fraction	2.50	Midway	1.25
Daisy	1.12	Mizpah Extension	20
Fairview Eagle	80*	Mohawk	14.50*
Florence	3.95	Montana Tonopah	2.75
Gold Bar (Bullfrog)	64	Nevada Hills	4.45
Gold Bar (Goldfield)	50*	Red Top	3.00*
Goldfield Con	5.12	Sandstorm	42*
Goldfield of Nevada	1.25*	Silver Pick	51
Gold Kewanas	70	St. Ives	96
Great Bend	60	Tonopah Extension	2.07
Jim Butler	86	Tonopah of Nevada	14.75
Jumbo	.....	Tramp Con	42
Jumbo Extension	1.42	West End	90

* Asked.

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. May 29.	Name of company.	Closing prices. May 29.
Adventure	2¼	Mohawk	84½
Ahmeek	.....	Mont. C. & C.	2⅞
Allouez	45	Nevada Con	13¼
Amalgamated	85⅞	North Butte	.....
Arcadian	.....	Old Dominion	47½
Atlantic	11½	Osceola	130
Balaklala	.....	Parrot	19½
Bingham Con	16½	Phœnix	.....
Boston Con	.....	Quincy	114
Butte Coalition	.....	Raven	.....
Calumet & Arizona	.....	Rhode Island	.....
Calumet & Hecla	840	Santa Fe	.....
Centennial	27½	Shannon	17½
Con. Mercur	.....	Superior & Pittsburg	.....
Copper Range	79¾	Tamarack	108
Daly-West	16	Trinity	20¼
Franklin	15¼	Troy-Man	.....
Granby	128½	United Copper com	57½
Greene-Cananea, ctf	.....	Utah Copper	59
Isle Royal	16	Victoria	7
Mass	5⅛	Winona	7½
Michigan	12¾	Wolverine	156

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

The Treadwell mines have been short-handed since the settlement of the strike. The mines will be operated as before, as an open shop, although union men will have no trouble in securing employment as long as they do not allow their union affairs to interfere with their work. The miners can board where they please; at the company's boarding-house the rate is $30 per month, and that sum will be allowed to those who board elsewhere. There is a shortage of water-power, as well as men, so the plants are not running to their full capacity. Machine-men are especially scarce, but more are arriving on every steamer. ——News from Nome states that more rich strikes are being made on the third beach.——Some rich copper ore has been found on Quartz creek, in the Agiapuk district, about 15 miles from the head of Bud creek. A shipment of four tons netted $475.—— At Ketchikan, the Mt. Andrew mine is adding to its force of men. A compressor has arrived for the Crackerjack mine at Hollis. A third shipment of high-grade ore will be made from the Alaska Commercial Co.'s Jumbo mine.——Work on the Ketchikan Con. Mining Co.'s property will be started as soon as the new 35-h.p. hoist arrives.

Engineers are making a survey for the road from the mouth of the Kotsina river to the mines on Elliott creek. About 1,500 men are employed in building the railroad from Cordova, and six locomotives, five steam-shovels, and 50 cars are at Seattle awaiting shipment, and the new 100-ton steamer of the Hubbard-Elliott Copper M. D. Co. for the Copper river has been landed at the mouth of the Tasnuna river.——At Knight's island the wharf of this company has been completed, and the tramway is being built, with a terminal ore-bin of 500 tons' capacity.

ARIZONA.

COCHISE COUNTY.

At Johnson, a strike of oxidized copper ore was made in the bottom of the 100-ft. shaft of the Imperial company. A cross-cut 30 ft. long at this point, is still in good-looking ground. Hiram Merrill is the superintendent.——The Bonanza Bell company employs 50 men, and is shipping regularly.

GILA COUNTY.

About 200 tons per day are shipped from the Arizona Commercial property at Globe. A new Shay locomotive and other equipment has been ordered for the railroad. Development is progressing well on the Blackhawk and Copper Hill mines of the company.——There have been no developments of importance recently in the Globe Consolidated property. The shaft on the Gem claim is now 680 ft. deep, and some water is coming in. The north cross-cut on the 500 level is still in porphyry and the south cross-cut is still in diorite.——The production of the Old Dominion smelter for May should exceed 3,000,000 lb., and fully 85% of the ore smelted comes from the company's mines. One-half of the concentrator was idle for a week, due to an accident to the Chilian mills. After the first of June, the company expects to produce metal at the rate of 15,000,000 lb. of copper per annum. The average of the ore is about 1¾%. For the year ending July 31, the officials predict a net earning of approximately $300,000.——The Castle Dome mine in the Lower Pinto country has been closed. Engineers sent to examine the property for parties in Calumet, Michigan, reported unfavorably.——The Superior & Boston is looking well, and the drift on the Black Oxide claim is in 90 ft. At the Limestone shaft, a cross-cut started north at a depth of 118 ft., is in 15 feet. At the Great Eastern, cross-cutting to the north is still in progress in mineralized ground.——Over 100 miners are now at work in the Octave mine.——Good ore is being taken out of the New York mine, upon which work was recently started by the United Mines company, under the direction of D. J. Sullivan.—— The Alaska mine is being unwatered at the rate of 30 ft. vertically per day.——A small force of men is working at the Leviathan.——About 10 men are working in the Seventy-six mine, at the foot of Rich hill.——Good ore has been developed in the property of the Mazatzal Copper Co., in the Tonto Basin country. Tunnel No. 1 is in 110 ft., and the Bullfrog tunnel is in 225 ft. A compressor has been ordered and air-drills will be used.

GRAHAM COUNTY.

Work has been resumed on the Sierra de Oro mines above Clifton. The principal development work has been done through tunnels.——The New England & Clifton Copper Co. netted about $70,000 on shipments of ore during the first three months of this year. Ore shipments were made from the Antietam, Buckeye, Copper, Regulation, and Copper King claims. The net amount received from the smelter per ton of ore shipped, according to the reports, was $21.66 per ton. A surface tramway is being built from the Antietam mines to the Shannon mines, in order to give the company an outlet to the Coronado railroad. A new 250-h.p. compressor will soon be installed. Alex. Veitch is the manager for the company.

MARICOPA COUNTY.

H. A. Hughes has taken over the entire interest in the Verde Queen mine, which is situated on the Verde river, 50

Map of Arizona.

miles north of Phœnix, and will start a force of men to work at once. The plan is to float the ore down the Verde and Salt rivers on barges, during high water.

PIMA COUNTY.

It is reported that good ore is being opened in the Helvetia property. The main shaft is more than 1,000 ft. deep.

PINAL COUNTY.

Reports state that a rush has been started by the news of a strike of placer gold near the head of Steamboat Springs cañon on the southern slope of Dripping Springs range, two miles southeast of Troy. The discovery was made by Mexicans, who have been dry washing.

CALIFORNIA.

AMADOR COUNTY.

A drift is being run on the 240-ft. level of the Defender mine, toward the intersection of the veins. Some good ore is being taken out and the mill will be started at once.—— The Tom and Dick mine, near the Defender in the Pioneer district, is considered a good prospect. S. P. Sharpless of Massachusetts has been examining it.——The miner's union at Jackson has voted not to take any drastic action on the refusal of the operators to recognize the union, and will await further developments.

CALAVERAS COUNTY.

The Eazybird mill in this county is producing a good grade of concentrate, that is being shipped from Martell to the Selby works.——The mines at Angels are all closed down, and several hundred men have left the town for Vallecito, Goldfield, and other camps.

EL DORADO COUNTY.

Some good specimens of ore have been found in the Crystal mine at Spanish Flat.——It is reported that rich gravel has been struck in the Delwisch mine in the Georgetown district.——The new 125-h.p. air compressor for the Sherman mine has arrived.——The Taylor mine in the Garden Valley district is being unwatered to the 200-ft. level, and examined. Herrup & Boski have a bond on it. ——A hoist will be installed at the Short Handle mine in the Spanish Dry Diggings district, owned by Lewis Sites.

NEVADA COUNTY.

Copper ore is being hauled from the California mine at Spenceville, to Wheatland, from which point it is shipped to the smelter at Kennett.——The Fairview mine, in the northern part of this county, is looking well. A good vein has been opened that assays from $4 to $8 per ton.——F. M. Spaulding has been examining the Richland mine, which is situated on Cement hill and is an extension of the old Manzanita gravel channel, near Grass Valley. ——The Morning Star mine has passed into the control of Bacon & Sweet of Oakland. This is considered a good prospect and a new surface equipment and pumping plant will be installed. E. E. House is the new superintendent, and the shaft on the Morning Star claim will be sunk 300 ft. deep, and the Badger Hill properties will be prospected through this shaft.——The mill of the Mountain View company, on Canyon creek, a few miles above Washington, will soon be running again, as the pipe-line has been repaired.——Freight is being hauled to the Grant King mine near Washington. A 20-stamp mill will be built at once. C. M. Carter is the superintendent, and 20 men are employed. A large low-grade vein is being developed.——A six-foot vein of quartz has been struck in the bottom of shaft No. 2 of the Gold Mound Mining Co.'s property on Deadman's Flat. The mine is owned by Spokane men, and has been developed by an 80-ft. shaft.——The Yuba and Mayflower mines at Maybert are being systematically reopened. C. S. Marriner is the manager and L. S. Strickler is the superintendent. About 20 men are employed, and a tramway is being built to connect the Mayflower mine with the mill on the South Yuba river. The mill has been entirely rebuilt and 10 new stamps added. The Yuba shaft will be unwatered, it having been idle since the Haggin and Hearst people abandoned it many years ago, after sinking 960 feet.

PLACER COUNTY.

The vein at the 1,200-ft. level in the Three Star mine is three feet thick and the ore is of good grade, 35 men being employed underground.——The new shaft at the Bellevue has been finished.——Three tons of ore from the Argonaut mine at Ophir yielded $1,880 to George Cooper.——The Rawhide company will run a tunnel 500 ft. lower than the present one. About 15 men are employed at the mine.—— A flume is being built to the Black Hawk mill on the north fork of the American river, preparatory to starting.——The Excelsior mine will soon be reopened by Denver people, and a large force of men will be given work.——At the Hidden Treasure mine 30 men are employed. The tunnel has been run 1,100 ft. Three men are prospecting on the Homestake mine in Volcano cañon. There is a 500-ft. tunnel, and a five-stamp mill is on the ground.

SHASTA COUNTY.

The bunkers on the branch railroad to the Hornet mine will be completed within a week, and shipments from the Hornet to the Keswick smelter will begin at once. Only one furnace is working at the smelter, but two others are ready to blow in.

SISKIYOU COUNTY.

The mill at the Czarina mine on Taylor creek is running continuously. C. W. Wolff is the superintendent.——A new quartz vein has been discovered by H. B. Wintering, while prospecting at the head of Applesauce gulch in the Liberty mining district.——At the Highland mine, a crosscut tunnel will be started on the China gulch side to tap the vein at a greater depth. Louis H. Cory is the superintendent.——J. M. Morrison is sinking an incline shaft on the Luke Shaw vein in Quartz valley.——A. F. McClaine of Tacoma is a partner of A. C. Brokaw in the Golden Eagle mine on Indian creek.——A. W. Graham, who built the Yreka dredge, has gone to Callahan to erect the Bucyrus dredge at that place.——The McKean mine, near Callahan, is looking well. The vein has widened, from two to five feet and runs well, cyanide treatment being used in milling it. At present, 40 men are employed and more are needed. ——Scott & Graves have bonded the old Bogle mine, and will sink on the vein.——The Summit and Golden Jubilee mines will be opened in a few weeks.——The McKinley Mining Co. is working a full force and keeping the 10-stamp mill busy.

TRINITY COUNTY.

The 40 stamps at the Bonanza King are dropping. The 5,000-ft. tramline is working well, and 65 men are employed in the mine. No clean-up has been made since the mill started, but a good yield of bullion is expected.

The Bear Tooth mine has been reopened. The mill was moved 1,500 ft. nearer to the mine.——The clean-up for the first month's run of the new 40-stamp mill at the Bonanza King mine was said to have been satisfactory. Joseph Porter is the manager for the Treadwell Brothers, at the mine.

TUOLUMNE COUNTY.

The new wire cable across the river at the Ellen Winton mine, is ready for use.——The Big Casino G. M. Co. recently granted the employees of the Mack mine an eight-hour day. This action was taken without any demand on the part of the miners. The mill, at Big Oak Flat, is running steadily, and the big compressor at Chinese station is working.—— R. B. McGinnis recently examined the Wide West prospect.——A suit has been started by the Rawhide G. M. Co. against the Dutch M. & M. Co., alleging that the latter company drove from a shaft on the Dutch mine, at Quartz Mtn., into territory pertaining to the App mine, and extracted through the deep workings, 20,000 tons of ore. The damage is placed at $150,000.

YUBA COUNTY.

The Marysville Gold Dredging Co. will build a third dredge, and the machine-shop will be enlarged to twice its present capacity. This company has had two dredges working for more than a year.

IDAHO.

BLAINE COUNTY.

Some silver-lead ore has been struck near Hailey, two miles southwest from the North Star group.—— On the Battle Ax claim the ore lies in the contact of limestone and quartzite.—— Stephen Coles, from New York, has been in Hailey looking into the affairs of the Idaho Mining & Improvement Co. It has developed that out of the $40,000 paid into the treasury, only $3,000 was spent on the property at Muldoon.——There are 60 men working in the mines of Tustin & George at Muldoon. A mill is being built and labor is in great demand, $4 for eight hours being the standard pay.——The Eureka mine, at Placer, is showing from six inches to two feet of galena on the 400-ft. level. Several carloads have been shipped. The property is owned by Salt Lake parties, and W. A. Wilson is the manager.—— The Garfield mine, a producer 20 years ago, is showing some good ore in development. The property is situated across the ravine from the Eureka mill. It belongs to Capt. Guyer, of Valparaiso, Chile.

OWYHEE COUNTY.

Work has been resumed in the raise in the Webster tunnel on the Banner property, to connect with the upper Banner tunnel, a distance of 216 ft. Development work in the north and south drifts is progressing satisfactorily.—— The ore-shoot in the No. 2 south drift of the Potosi continues from 10 to 18 in. wide, carrying good ore. The

Knickerbocker raise will be finished within a few days.—— The directors of the Village Blacksmith Mining Co. have recently visited the mine. New machinery will be installed. ——Supplies are being hauled to the Camp Bird mine on North Sinker creek, where a two-stamp experimental mill will be installed.

SHOSHONE COUNTY.

(Special Correspondence).—Seventeen million dollars, netting profits of $6,436,756.03, is reported to be the gross yield of eight of the big producing mines in the Coeur d'Alene district for 1906. In the sworn statements to the assessor of Shoshone county, required under the new State law, the cost of extraction was $4,329,517.52, upon a tonnage of 1,521,551. The cost of the transportation, reduction, and sale of the produce amounted to $4,652,436.90 and the improvements $930,335.20. The Federal Mining & Smelting Co. with its four mines, the Morning, Standard-Mammouth, Tiger-Poorman, and Last Chance, holds the record, with a gross production of $7,775,770 and a net profit of $2,685,213.76, but the Bunker Hill & Sullivan surpasses all in the record for a single mine, the gross yield being $4,771,748.35 and the net profit, $2,264,389.22.——The reports show that the ore from the Snowstorm mine was treated much cheaper than any other properties in the group, while the Hercules is the richest. The Frisco, Hunter, and Tamarack-Chesapeake report losses for the year. This is due to the development work being under way at these mines during the year and but little ore being shipped. The Frisco reports improvements of $122,021.46, included in which sum is the unwatering of the mine. Its net loss is given out at $117,389.56; the Hunter, $89.26 and the Tamarack-Chesapeake, $10,234.09. ——Another strike has been made in the Snowstorm mine near Mullan, the ore being encountered in No. 4 tunnel, which is being run 3,500 ft. to get the main vein. The tunnel is now in 1,600 ft. and has broken into what appears to be an immense lode. The workings first encountered a seam of talc four feet thick, and then entered decomposed vein-matter, so soft that the timbers have to be kept up to the face to prevent caving. The mass, which has been cross-cut for 20 ft., carries copper, galena, and lead carbonate.—— The Bunker Hill & Sullivan M. & C. Co., operating a silver-lead mine at Wardner, declared dividend No. 116, amounting to $180,000 for May. This is the company's regular monthly dividend and brings the total amount of dividends paid since Jan. 1, 1907, to $900,000, and total to date, $8,766,000.—— Another strike has been made near Wallace, on the property of the Chicago-Boston Mining Co. The vein was found in a 25-ft. cross-cut, at a depth of about 80 ft., and the second wall is not yet in sight. The ore is of good milling quality, rich in silver and lead. The vein will be cross-cut until its full width is exposed, after which it will be explored with drifts.——Reports are current that the directors of the Snowstorm Mining Co. have decided, in case all goes smoothly at the mine, to disburse a total of 45c. per share in dividends between May 10 and Jan. 1, 1908. The condition of the mine, the funds on hand, and the returns from the ore all justify such a rate, it is said. Present plans are to pay 5c. per share May 10, June 10, and July 10 and 6c. per share on the 10th day of each remaining month in the year. This will entail the distribution of $675,000 in dividends during the next eight months.—— Stockholders of the Pittsburg Lead M. Co., owner of the Black Cloud mine on Nine Mile creek, will pay a dividend this summer, probably in June.——Another strike has been made in the Golden Chest mine, near Murray, that seems to prove the richness of the property. The vein was encountered in a cross-cut 30 ft. east of the main tunnel, and 3,000 ft. from the portal. The vein is said to be seven feet wide from wall to wall in ore.—— W. T. McHatton of Butte, acting on behalf of the Northwestern Ore Purchasing Co., has arranged with the O. R. & N. company for a piece of ground, 125 by 500 ft., on the railroad tracks below Wallace, where $25,000 will be expended in the erection of a custom sampling works. The building will b 40 by 96 ft., and will be equipped with sample machinery to handle 200 tons of ore every 24 hours. The plant will be ready in July.

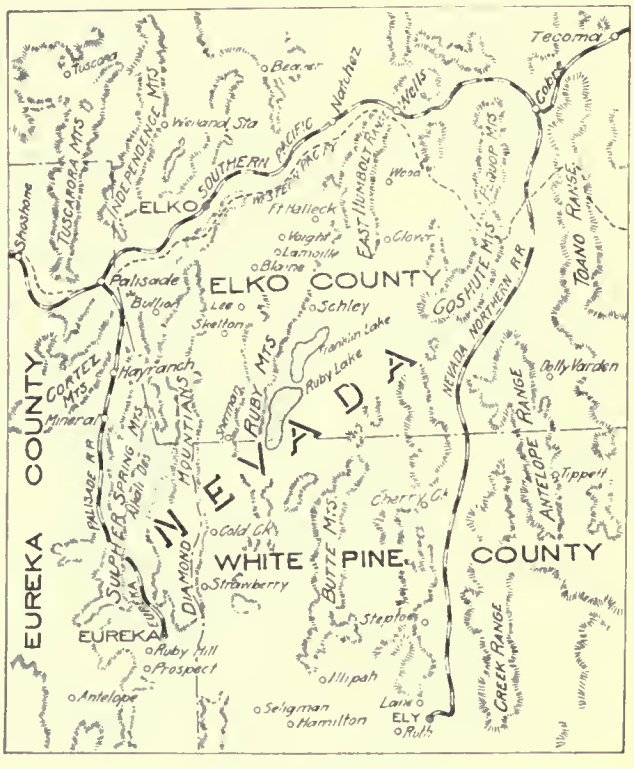
Spokane, May 25.

BEAVERHEAD COUNTY.

The Dillon-Argenta Mining Co. has begun work on one of the company's claims below Argenta. A shaft will be sunk 100 ft., being at present 30 ft. deep, with ore carrying gold, silver, and copper showing in the bottom.——The new smelter of the Silver Fissure Mining Co., at Polaris, will be blown in soon. Henry H. Armstead, Jr., is directing the affairs of the company. The traction-trains are taking in coal and supplies from Armstead to Polaris and everything at the property is in readiness for starting.——Some good silver ore has been struck in the Kent mine of the Butte & Dillon company. Shipments will commence June 1, good ore being stoped in a 35-ft. winze 900 ft. from the portal of the tunnel.——Active work is in progress at the property of the North Dakota Mining Co., near Polaris. T. E. Farnham, of Carrington, N. D., is president and Dan Burkholder superintendent.

FERGUS COUNTY.

A good orebody has been developed in the property of the North Moccasin Gold M. Co., at Kendall. A drift has been run in ore for 300 ft. and a winze sunk 150 ft. on the vein is bottomed in ore.——A good deal of development work is



Map of Eastern Nevada.

being done on the Collar Gulch property, near Maiden. Frank Weeks is the manager.——A new strike is reported in the Cumberland mine at Maiden. Engineers have reeently examined this property for Butte and Chicago parties.——Work has been resumed on the Sunrise group, near Maiden, and shipments will probably be started this summer.

NEVADA.

HUMBOLDT COUNTY.

(Special Correspondence).—A good strike of ore running 800 oz. silver per ton, with a little gold, has been made in the Big Six group. The vein has been traced 250 ft. and is about four feet wide. It is reported that the group has been secured by the Schwab interests.——The Rosebud Syndicate M. Co. has uncovered a vein from which picked samples run $35 gold, $30 silver, and 10% lead. A cross-cut has been driven 22 ft. and the wall has not been reached. ——Ore running $50 in gold has been struck at a depth of 20 ft. in the Gold Anchors mine. Three cross-cuts have been driven to tap the shoot.——At the Brown Palace excellent ore has been encountered and a good lode has been exposed. Several men are engaged in development work and the mine is showing up well. The property is owned by Charles M. Schwab and friends.——William Beeley an

John J. Langan have located oil land 10 miles southeast of Rosebud, and are planning to commence boring in the near future for oil. R. M. Edmunds, an experienced oil operator, states that the indications are excellent.——Work has commenced on the Stock Exchange building, which will be a two-story structure.

Rosebud, May 22.

LINCOLN COUNTY.

(Special Correspondence).—Seven mines in this district are shipping ore.——Good ore has been encountered in the 150-ft. level at the Ajax-Bullfrog and is being blocked out. The silver is diminishing, while the gold is becoming more plentiful. The high-grade rock is being shipped to the smelter, and the low-grade is stored on the dump. The new mill will soon be erected.——At the Searchlight Gold Extraction, active work has been resumed. A prospect shaft is being sunk on the vein, which is three feet wide on the surface. E. G. Woodworth is superintendent.——The main shaft on the Big Tiger is being sunk to the 400-ft. level. A strike was recently made on the 250-ft. level and good ore was found.——At the Nevada Crescent, high-grade ore is being sacked, and the three-foot vein is being developed. The ore was found at a depth of 15 ft.——Good ore is reported from the Double Standard.——The winze in the Syndicate tunnel at the Golden Crescent is in good ore, and the vein which recently faulted has been found. A. J. Waddleton is in charge of the mine.

Crescent, May 21.

(Special Correspondence).—The New York Searchlight company will build a 10-stamp mill on its property. It has also purchased a 50-h.p. four-cylinder Union hoist, a 12 by 12 air-compressor, power drills, ore cars, rails, and double-deck cages. These are the first cages to be installed in the district, skips invariably being used. Power from the McCready electric plant at the Santa Fe mine will be utilized for the compressor, and the shaft and buildings will be lighted by electricity. A diamond-drill outfit has been ordered.——On the Golconda, which adjoins the New York Searchlight, a 15-h.p. hoist, a 6 by 6-in. air-compressor, and Little Wonder drills have been ordered.——At the Searchlight Belle, the shaft is down 175 ft., and is being driven on the vein, which started at about 65°, but at 120 ft. changed to 85°. This shaft has opened five feet of vein-matter, of which three feet is pay. The Searchlight Belle is near the Wyoming Searchlight, where on the 200-ft. level a 30-ft. vein was opened; and also adjoins the Santa Barbara, Golden Rod, and Searchlight Western.——Another property being developed by R. H. B. Warburton is the Ajax Bullfrog mine at Crescent, where some good ore has been cut. The shaft is in ore, of which an 18-in. streak runs well. This rich streak is on the foot-wall. Levels are being started at various points in the shaft, and they will be driven on the vein.——The Searchlight Gold Dollar M. Co. will commence development on the Yellow Rose claim. This property adjoins the Gold Dyke and Golconda and is north of the Colorado M. & M. Co.'s property. In the present 40-ft. shaft, a fair showing has been encountered. Cyrus S. Chapin is the president of the company.——The Calavada M. & M. Co. will begin operations on its ten-claim group, 12 miles north of Searchlight. R. L. Blackburn is the secretary of the company. The company's holdings are well situated near the St. Louis mine, which has been a producer. The property is developed by a 4 by 6 shaft, which is now down 60 ft. At the bottom of the shaft there is a three-foot vein.——The shaft on the Searchlight Midas, in which 100 ft. was recently contracted for, is nearing the water-level, and the orebody is showing up well. When the additional 100 ft. is added, a drift will be run into the vein, east of the shaft.

Searchlight, May 17.

WHITE PINE COUNTY.

The Badger shaft of the Ely Mines Co. has been sunk to the 100-ft. point in 30 days.—— There are 30 men working on the Chainman shaft, which is being sunk vertically, with two compartments, alongside the old incline shaft.—— The Ely Consolidated continues to ship high-grade ore from the Sunshine shaft.—— The foundations for the ore-bins of the Star Pointer have been started.—— The Butte & Ely company has resumed sinking in the April Fool shaft.—— The boiler is in place at the Beehive shaft of the Butte & Ely.—— W. R. Miller and W. A. Williams have given a short-time option on their group of 18 claims in the Tamberlaine district to Eastern capitalists. These claims are 10 miles east of Ely.——In another two weeks the Keystone tunnel, being driven by the Nevada Northern in laying track to the Star Pointer, will have holed through.——The Giroux company is hauling a consignment of 35% copper ore from the Alpha shaft to the railroad for shipment to Salt Lake smelters. The shipment will be about 300 tons. ——The Mizpah Con. G. & C. Co. has begun work on a new tunnel on the Nevada Northern vein, which will tap the lode at a depth of 200 feet.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Hidden Fortune and the Columbus Consolidated mines at Lead, have been consolidated under one management. Bonds for $400,000 have been issued to further develop the properties. The consolidation was brought about through the foreclosure of a bond issue of $250,000 on the Hidden Fortune mine, by the Continental Trust Co. The office of the company will be in New York.

WASHINGTON.

CHELAN COUNTY.

Excitement prevails at Chelan over the discovery of veins on Chelan Butte, carrying gold, and a stampede is now on to the scene of the find. Specimens show stringers of free gold in large quantities. Miners say that the ore resembles Cripple Creek ore. The veins are well defined, and a large number of claims have been located.——Spokane mining men give credence to a rumor from Chelan that Jay P. Graves has plans for the organization of a $5,000,000-company to take over and develop the various projects in the Chelan district on which he now holds options. The plan, as reported, is that the company shall own and operate the Holden mine, the electric road from the mine to the shores of Lake Chelan, a line of steamers on the lake, an electric railroad connecting the foot of the lake with the Columbia river, and a smelter at some point on the lake or the river.——J. A. Goulden of New York, announced in Spokane that he and his associates will build a railroad from the Red Mountain mine in the Chelan country to the Great Northern main line, 26 miles north. It is stated that this mine is one of the richest copper properties in the Northwest. Work on the road will be begun at once, and, as soon as it is finished, ore will be shipped from the mine to the Tacoma smelter.

FERRY COUNTY.

Official announcement is made that the Belcher Mountain Gold & Copper Co. will build a railroad from Belcher Junction to its camp, in northeastern Washington; also that a 500-ton smelter will be installed this summer. The mines which will contribute to it are the Belcher, Copper Key, Bortel, Oversight, Iron Queen, Midnight, and a half dozen others. New machinery is being placed on the Oversight. When ready, a shaft is to be sunk to a depth of several hundred feet on one of the claims belonging to the company.——The Winnipeg is installing a seven-drill Rand compressor. The vein is a large one, and carries copper-gold ore.——The Bridge Creek Mining Co., which has 100 acres of mineral ground 15 miles north of Keller, the groups comprising the Midnight, Veda W., Gold Crown, Silver Pack, and Number Seven, has driven the tunnel 246 ft. D. H. Wells is the superintendent. The company is composed of Iowa and Spokane people. The president is E. H. Arthur of Scranton, Iowa, while A. L. Braley of Spokane is secretary and treasurer.

OKANOGAN COUNTY.

The Twisp Gold-Copper Mining Co., the control of which is held by Glen B. Creighton and Frank R. Creighton of Spokane, has let a contract for a 150-ft. continuation of the 80-ft. cross-cut on the company's property, 20 miles from Twisp. The cross-cut is passing through country rock

which assays $5 per ton in copper, returns as high as those obtained from much of the Granby ore.——John Thomas, under whose direction the Salmon river mine on Peacock Mtn. in the Okanogan country, northwest of Spokane, is being developed, is authority for the statement that a tunnel from 3,500 to 4,000 ft. long will be run. This long cross-cut will drain the mine, and will afford a most economical outlet for the ore. Work will be begun this season. A raise being run from the present lower tunnel has proceeded 124 ft., 109 of which is in ore. The property is owned by Minneapolis capitalists, and R. A. Hutchinson of Spokane also owns an interest.——Two feet of ore, carrying about $40 per ton in copper, has been cut in the property of the Multnomah M., M. & D. Co. at Nespelem camp. The ore was cut in the east drift from the long cross-cut tunnel which is now in 1,000 ft. Another strike was recently made at a depth of 10 ft., on a claim recently located for the company. The ore at that shallow depth gave returns of $37 per ton. F. O. Hudnott, the general manager, says they will continue the long tunnel another 1,500 ft., as there are a number of veins in the mountain to be explored. The cross-cut has already exposed four veins. They have the water-power of the Nespelem river, which they will develop this summer, to install electric power for the mines.

MEXICO.

CHIHUAHUA.

Gold bars valued at $130,000 have just been received in Chihuahua from the Batopilas Mining Co., for shipment to New York. The Waterson company at Ocampo sent a $13,000 shipment.——Rumors are circulating to the effect that the U. S. M. S. & R. Co. has bought the San Pedro mine of the Cia. Minera de Naica, for 6,500,000 *pesos*. This may result in a smelter being built at Jimenez. Also, it is rumored that the Ramon Corona mine at Naica has been sold to George Carothers of Torreon for 200,000 *pesos*.——A great many complaints are being made against the Palmarejo & Mexican Goldfields Ltd., an English company operating in the Chinipas district in western Chihuahua. The reports are that this company is trying to keep mining men out of the district.——The new 50-ton experimental plant of the San Francisco del Oro mines in the Parral district will be running by August 1. James E. Hyslop is the manager for the company.——Charles M. Schwab is reported to have paid $1,000,000 to D. Manuel Gameros for the Central Juarez, and mines in Sta. Eulalia camp, 15 miles from Chihuahua. The Central property consists of 146 *pertenencias*, and the Juarez of 31.——The annual report for the Batopilas Mining Co. for 1906 shows a net surplus of $314,337. The capital stock of the company is $9,000,000, and there are outstanding 6% gold bonds for $459,700.——The 80-stamp mill for the Quebradillas mine in the Minas Nuevas portion of the Parral district, being built by the Cia. Industrial Mexicana, will be in operation by September 1. John W. Conner is the manager for the Veta Colorado M. & S. Co., which owns this property.——The new mill for the Santa Barbara silver mine of the Cia Minera de Rio de Plata, beyond Guazapares, is all ready to start. D. W. Shanks is the manager

COAHUILA.

A company of Texans is running a 2,000-ft. tunnel on the property in El Aguas district, west of Castando. The tunnel is now in 1,400 ft. and when completed will cut the vein 800 ft. below the workings of the mine. E. L. Swasey is the manager.

DURANGO.

The MacDonald Brothers have purchased La Perla mines in the Topia district of Durango, near the Sinaloa border, for 300,000 *pesos*. A company will be organized and a mill built.

SONORA.

About 20 miles northeast of Hermosillo, the Sonora Bi-Metallic Mining Co. is operating Las Animas mine. Several shafts are being sunk, the main one being 150 ft. deep. A. J. Nickel is the manager and J. Cransford the superintendent.——Shareholders of the International Copper Mining Co., from Kansas, have been visiting the property, about 45 miles northwest from Hermosillo.——The Tezopaco Copper Co. is developing copper properties in the Alamos district, between Movas and Tezopaco de Rosario. W. W. Harper is the superintendent. The ore will be shipped to the National Metal Co. of Hermosillo.——C. B. Ward is developing Los Tajos mine, near Escalante station, below Torres. This property was once a producer, but has filled with water.——The enlarged mill of the U. S. A. syndicate at Tortuga, 25 miles east from Hermosillo, will start June 1 with a capacity of 90 tons per day.——The shaft is down 100 ft. on the Animas mine, near Llano station.——The Sonora Quartz Mines D. Co., operating La Yaqui and El Tiro mines at La Yaqui in the Altar district, has suspended operations, and it is reported that a consolidation may be effected with the Reina de Oro Mining Co., which owns adjacent properties.——A new hoist and boiler will be installed at the South Cananea No. 2 shaft.——It is reported that New York and Philadelphia people have bought the Cananea Eastern property, in the Cananea district.

CUBA.

Consul R. E. Holaday, of Santiago, transmits a report on the mining industry of that part of Cuba, which follows: Mining is one of the principal sources of wealth of the province of Santiago de Cuba, owing to the abundance and accessibility of the minerals. Iron is the most abundant, but copper and manganese are found in sufficient quantities for profitable exploitation. Gold, lead, zinc, and asphalt are also said to exist, but so far there has been no development of any of the mines said to contain these minerals.——Four principal companies are engaged in mining and exploiting minerals. From the mines at Daiquiri, 3,536,121 tons of ore were produced to December 31, 1906. The production for the year 1906 was 510,500 tons. The ore has all been shipped to the United States, except about 75,000 tons, which went to England, Germany, Belgium, and Cape Breton, Nova Scotia. The Daiquiri ore, which is red hematite, occurs on the hillsides, usually near the top, and the mining is all open-cut work, more in the nature of quarrying, the only underground work being the exploration tunnels. The company also owns several iron mines on the north coast, in the Mayari Mtn., back of Nipe bay, and is about to commence the construction of a broad-gauge railroad from the mines to the bay at Cagimaya, at which place will be built two wharves and other necessary equipment for economically handling the ore and exporting it to the United States. It is estimated that it will be possible to ship 1,000,000 tons annually.——Another American company operating near the Daiquiri mines shipped its first ore in 1884, since which time about 5,000,000 tons have been produced, nearly all going to the United States. The ore is transported by rail from the mines to Santiago bay, where the company has a fine steel pier.——Copper deposits exist throughout almost the whole of the southern portion of Santiago province, but so far the only attempt that has been made to mine it for exportation is in the vicinity of El Cobre, about 15 miles west of Santiago. A deposit of extraordinary richness exists in this territory. It is said that during the 23 years El Cobre mines were operated more than $50,000,000 worth of copper was produced. The works were entirely destroyed during the war of 1898. In 1902 an American company purchased them and began to drain them by means of enormous steam pumps. The expense of this operation was greatly reduced by forcing the water in the mines through a system of tanks filled with old iron, whereby the copper which it contained was precipitated in the form of a cement. At tide-water on the bay, the company erected reduction works, comprising a smelter and concentrator, the latter having a capacity of 300 tons per day. Owing, however, to a series of accidents at the mines, whereby the output has been greatly curtailed during the last year, these are not in operation now. The copper contents of the ore mined is about 5%. The company operates about 12 miles of railroad, extending from tide-water on the bay to the mines.—— During 1906, iron of a value of $2,210,331, was shipped; manganese, $83,000; and 24,558 tons of copper ore, valued at $330,236.

Special Correspondence.

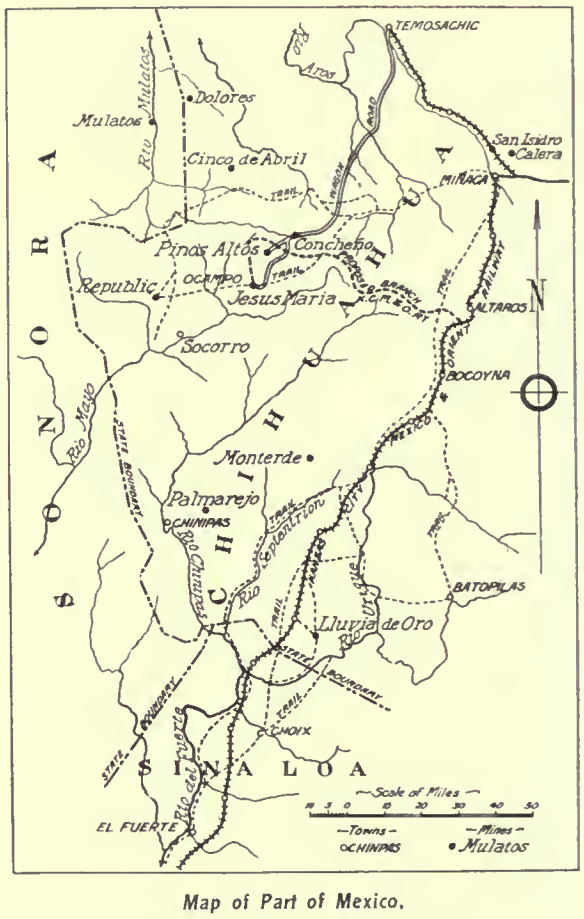
London.

Dolores Quarterly Report.—Difficult Conditions.—Another Mexican Company. — Esperanza to Mill Entire Output. — Penn-Wyoming Copper. — Deep Leads in Victoria. — Siberian Mining and the Interest in It.

Dolores Limited has issued a report for the three months ending March 31. There were 3,563 tons of ore treated in the mill, of this 770 tons underwent pan-amalgamation and 2,793 were cyanided; the average value per ton was $50. The production for the quarter realized $131,000, the estimated profit therefrom being $64,000. January and February milling included a small quantity from the dump. The residue from the slime-plant in January assayed $3.50 to $4 per ton. The total capacity of the mill is reported as 75 to 80 tons of ore per 24 hours, all to slime, but the slime-plant can only handle 50 to 60 tons of this per day until the Butters filter is installed. Some progress was made with the improvements to the mill; foundations for the concentrators were completed; the Dorr classifier and Frenier sand-pump were installed; two Wilfley tables were put in successful operation in March; the concentrate produced therefrom assayed 20 oz. gold and 870 oz. silver per ton. The new tube-mill was being riveted together and would require a month more to complete. Regarding the mine development, the report states that on the fourth level the assay-value dropped to $5 and $10 per ton 70 ft. north from the shaft. After driving 25 ft. farther, a cross-cut was put into the north wall. This broke into ore two feet wide assaying 9.48 oz. gold and 273.92 oz. silver per ton, yielding an average as sent to mill of $93 per ton; 20 ft. from this point the value as broken in the level was $30 per ton. The entire drift was in ore without walt on either side. The ore at this (the deepest) level is well suited for cyanide treatment, as no increase of sulphide is indicated. In March, a farther advance north of 32 ft. was made, the ore lowering in value to $7 and $10 per ton. The manager thinks they have been driving in a lean part of the lode, which is wide, and that the rich ore is probably in one of the walls. He has started a cross-cut to test this. It is thought there may possibly be 300 ft. farther to drive before reaching the San Francisco vein. On the New (No. 2) vein in the San Francisco cross-cut, a drift was started in January. Assay of 6-in. solid streak gave 1.84 oz. gold and 625.75 oz. silver. Another assay showed 2.26 oz. gold and 332.72 oz. silver. The present working on this vein has developed a short shoot, 30 ft. long, which will average 8 in. sold mineral, worth $329 per ton, or an average for the full width of the drift, including the rich streak, of about $40. The labor and freight conditions still worry the manager at Dolores. In January the labor supply was fairly good, but in March the conditions were less favorable. The manager reports: "This being the planting season, a number of our miners and trammers have left, which makes us very short of labor. The labor condition still continues serious and it will probably be necessary to limit the development work and put some of the men to mining. This shortage of men adds to our difficulties, as we are compelled by necessity to use men whom we would not use, could we do otherwise." As to freight, great trouble was experienced in February in getting supplies over the Mexican Central railway, which is lacking in both cars and locomotives. The low production in February was due to the shortage of cyanide from this cause, and the delay in freight continues to hamper progress in both construction and mining.

Under the auspices of the Venture Corporation, the Mexican Mining & Industrial Corporation Ltd. has been formed with a capital of £153,750 in 150,000 ordinary shares of £1 each and 75,000 deferred of one shilling each. There is no public issue. It is understood that the new corporation has already in hand the flotation of an important enterprise in Mexico.

A new departure has been taken by Esperanza management. As it is absolutely impossible to secure an adequate supply of cars from the railway, they have decided to mill all the ore at the mine. This, they state, will reduce the monthly profit, but it will increase the profit per ton treated, thus securing larger gain spread over a longer period. The results of the working operations and developments of the mine for the period from January 1 to March 31 this year have been published, the net profit for the quarter, after deduction of all expenses in Mexico and New York, having been $453,903.



Map of Part of Mexico.

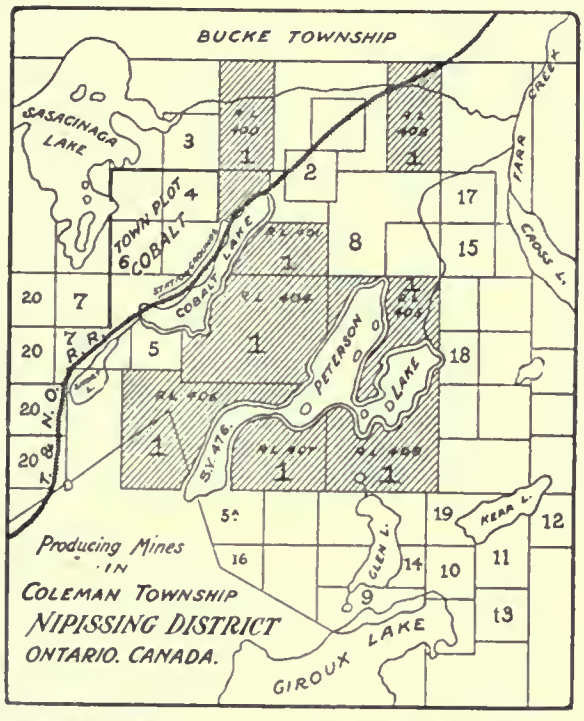
Showing the position of the Dolores mine.

The fortnightly report to the end of April last of the Penn-Wyoming Copper Co. has been issued; it shows that the Company has made £62,700 net profit since the new re-modeled smelter started on March 15 last. This works out at an average of £10,450 per week for the six weeks. The secretary states that the daily output will not be increased until the branch railroad connecting the Company's works with the Union Pacific railway is completed next month, but even on the present earnings the Company could pay 27% on the entire issued capital. It is also said that the new re-modeled 1,000-ton smelter is working well enough to give the Company a net profit of £70 per ton on its output at present market prices. The *Globe*, in publishing this information, remarks: "Penn-Wyoming shares have been largely bought both in London and Paris, and the foregoing information ought of prove of more than usual interest to holders." Having regard to these particulars there must be some "hard swearing" somewhere if what T. S. states in the

MINING AND SCIENTIFIC PRESS of March 23 has foundation in fact.

According to the latest news from the general managers at Melbourne to Loddon Valley Goldfields Co., the miners were driven out by a rush of sand when opening into wash in No. 1 cross-cut south at the 454-ft. level. "Main cross-cut east—Wash has been entered, but too much gas and water for continuing work for week or so. No. 3 rise driven in wash 198 ft.; average, 8 dwt. 19 gr. per fathom. No. 4 rise 19 ft.; average, 4 dwt. 13 gr. No. 5 rise 110 ft.; average, 13 dwt. 14 gr. per fathom." Gas and water have hitherto been all too prominent a feature in this company's operations, but the promise of gold from the wash appears now to become nearer of achievement.

In your issue of April 13, C. W. Purington complains that the editorial blue pencil has not done its work on my correspondence when it has happened to refer to Siberia.



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Trethewey Silver-Cobalt Co.
4. Coniagas Mining Co.
5 & 5 A. McKinley-Darragh.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay

After such "waste of space" it is somewhat remarkable that Mr. Purington should occupy a whole column on the subject himself. Your London correspondent does not write for the purpose of inducing "the American" to "follow the Londoner in Siberian investments." His object is simply to reflect what is passing in London at the moment—not to offer any "apology" or "defense" for Siberia or any other mining field. Mr. Purington states from personal acquaintance with the country (a privilege denied to the ignorant "average Londoner") that Siberia "contains one of the world's greatest stores of accessible gold" and that "the American engineer today who acquires a working knowledge of the Russian language will add a valuable asset to his equipment." Is it then really true that Americans have no use for news of what is doing to develop the wealth of other countries, because their own country is rich in mineral resources? This is parochialism with a vengeance—the village pump *in excelcis*. In the present day any country however "remote" can exert an influence on the world's commerce by its output of the precious (and other) metals. To show that the superior person is not always the best informed, your correspondent may mention that he has indisputable authority for disproving Mr. Purington's assumption that the "American investor" takes no "practical interest" in Siberian mining. As to the lack of "discrimination in the investments" due to the "utter ignorance" of the "average Londoner"; is this peculiar to Siberia? Has it not happened that Londoners have put their money on investments "nearer home" concerning which not only the said Londoners, but also the local experts who advised them, have shown a lamentable lack of judgment?

Toronto, Canada.

Government Report on Mining.—Institute Meeting.—Shipments From Cobalt.—Latest News From the Mines.

The Canadian Department of Mines has authorized the collection of authentic data for a detailed report on the mining and metallurgical industries of Canada. It will include only mines producing and those undergoing development and metallurgical plants. Full information will be given concerning the operating companies, the character, quality, and source of the raw material, nature of the output, methods and processes employed, and cost of production. The frequent enquiries for such information have shown the need of the publication. R. R. Hedley, of Nelson, B. C., has been appointed to collect the data for British Columbia and the Western provinces.——The annual convention of the American Institute of Mining Engineers will be held this year at Toronto, commencing July 23, a cordial welcome on behalf of the province having been extended by Premier Whitney. After the convention, which will occupy two days, a trip under Government auspices will be made to Cobalt, where a couple of days will be spent in examining the mines. Opportunities will be afforded to visit the Sudbury district and the Hutton iron range, and other side trips may be arranged including the country on the Hudson Bay slope.——R. W. Brock, who has had a wide experience of the mining industry in British Columbia, has been appointed by the Provincial Government of Ontario to make an examination of the Larder Lake area, and report as to its nature and possibilities.

Shipments of ore from Cobalt for the week ending May 18 amounted to 198 tons. The shipping mines were Coniagas, 85 tons; O'Brien, 85; and Temiskaming, 27 tons.—— The Foster mine has been rather under a cloud lately, and reports to its discredit have had a depressing effect on the market. A complete change of management was recently effected. John G. Kent, the new president, and Joseph Oliver, a director, have gone to Cobalt to arrange for a careful examination of the property. Frank C. Loring, consulting engineer, has been retained, and a thorough report will be presented.—— John Harris, mine captain of La Rose, has been replaced by W. H. Jeffries, a Western miner.—— A strike has been made on the Silver Bird property at 115 ft., showing native silver and smaltite.—— On May 23 an important discovery was made on the University property, now owned by La Rose interests. It comprises a perfect network of veins of pure native silver, the rock around each vein being broken and loose, indicating that they probably meet in one large vein. A strip of about 10 ft. has been uncovered.—— At the Coniagas, which has latterly taken a prominent place among shipping mines, 1,450 ft. of driving and cross-cutting has been done at the 75-ft. level. The concentrator building is about completed. When in operation it will handle all ore of a grade below 300 oz. per ton.—— Ninety men are

engaged on the Colonial mine working on the shore of Cross lake. A shaft is down 100 ft., and 40 ft. of driving has been done under the lake. Three adits have been driven into the hillside for several hundred feet.—— At the Nova Scotia 95 ft. of driving has been done at the 60-ft. level, and 240 ft. at the depth of 100 ft. in the main shaft, and 195 ft. on shaft No. 3.

Salt Lake, Utah.

Park City Consolidation.— News From Tintic.— Ore Shipments.— Another Transfer of Property.— Freight Rates.— New Mills.

Articles of incorporation of the Silver King Coalition Mines Co., capitalized for 1,250,000 shares of $5 par value, have been filed. David Keith is president; Thomas Kearns, vice-president and general manager; W. S. McCornick, treasurer. This organization is a result of the consolidation of the Silver King, Keith-Kearns, Magnolia-St. Louis, Pinyon Ridge, Odin, Belmont, and other Park City mining companies, involving all told about 2,000 acres of ground. The mill of the Keith-Kearns company will be dismantled and moved to the site of the Silver King plant to increase the capacity of the latter about one-third. It has been officially stated that a dividend will be paid by the new company in July. The consummation of this deal is considered to be one of the most important mining transactions of the year.——At the annual meeting of the Daly-Judge Mining Co., held at Jersey City, N. J., H. Otto Hanke was elected president, succeeding John J. Daly, retired; Moylan C. Fox, of Salt Lake, is vice-president; and G. W. Lamborne, of Salt Lake, secretary and treasurer. Frederick P. Burrell, who, in late years, has been in charge of California and Mexican mines, has been appointed mine-manager.

The Beck Tunnel Consolidated Mining Co., operating in the Tintic district, is sinking a new double-compartment shaft, which will enable the more economic handling of ore in the future. A possible reduction in the June dividend has caused a drop in the stock; however, the mine is said to be looking well.——The Colorado mine, at Tintic, paid a dividend after only a few months' energetic development work. An orebody of large size has been opened up. A new shaft is being sunk within 250 ft. of the Beck Tunnel side-lines.

Ore shipments from Tintic last week amounted to 142 carloads, the contributing mines and respective amounts being: Ajax, 5; Beck Tunnel, 6; Bullion-Beck, 6; Carisa, 4; Centennial Eureka, 54; Colorado, 8; Dupue, 4; Eureka Hill, 1; Godiva, 2; Grand Central, 9; Lower Mammoth, 6; Mammoth, 2; May Day, 2; Undine, 1; Legion Valley, 4; Scranton, 6; Shoebridge, 1; Tintic Iron, 7; Uncle Sam, 4; United Sunbeam, 1; Victoria, 3; Yankee Con., 4 carloads.——The final steps in the change of ownership of two Tintic properties, the Sioux Con. Mining Co., and the Utah Con. M. & M. Co., are now being taken. These companies were formerly controlled by Utah people, but later passed to Franklin Farrel and associates of Anasonia, Conn., back in the '80s, who operated the properties for a time, but finally closed them down in 1900. Recent developments in mines adjoining, particularly in the Beck Tunnel and Colorado, has resulted in the consummation of a deal whereby Mr. Farrel and associates are to turn the Sioux and Utah properties back to a Utah syndicate, with which Reed Smoot and Thomas R. Cutler are the leading spirits. At a special meeting of shareholders, the capital stock of the Sioux company has been increased to 1,000,000 shares, of $1 each.——The Tintic Mine Owners' Association has again taken up the matter of freight rates with the railroads and an effort is being made to induce the latter to reduce the tariff on certain grades of ore shipped to the Salt Lake valley smelters. The rates now in force are: $1.25 per ton for ore valued at $15 and under; $2.25 per ton for ore valued above $15 and under $25 per ton, based on the gross valuation. The mine owners want the gross valuation to serve as the basis in the future.

Chihuahua, Mexico.

Parral's Production.—New Concentrating Plant.—La Perla Group.— El Rayo Co.—Real de las Nogales.—New Street Railway.— Santa Barbara District.—Transfers and Sales.

The approximate production of the Parral camp for April was 20,970 tons, disposed of as follows: Shipped to smelters, 9,160; locally treated, 11,810 tons. The ground is being broken for the 100-ton custom concentrating plant to be erected by the Parral Reduction Co.; this is to be built about one mile west of Maturaña, the first station out of Parral on the Mexican Central railroad, about four miles east from Parral. At present a well is being sunk to supply water to the mill, and the grading and excavation for the plant is being hurried. A. P. Diescher, the engineer in charge, states that the concentrating plant will consist of one Blake crusher, three sets of Power & Mining Machinery Co.'s 16 by 36-in. rolls, two sets of double-three Hartz jigs, three sets of double-four Hartz jigs, cone-classifiers, Callow tanks, and four Wilfley tables. A complete steam-plant has been purchased consisting of a 300-h.p. Wisconsin compound Corliss engine, and Scotch marine boilers. Seven cars of machinery are now being held at El Paso until a switch can be secured from the railroad company. It is the intention to connect the mines in the immediate district with this reduction plant by means of a narrow-gauge railway. The stockholders of the Parral Reduction Co. are also largely in the Pittsburgh & Parral Smelting & Refining Co., the Providence Mining Co., the Big Four Mining Co., and the Garrison Townsite Co., operating in the immediate district. Five directors of the Parral Reduction Co. are: A. R. Hunt, general manager of the Carnegie Steel Works at Homestead; James Scott, general manager of blast-furnaces for the same works; H. O. Williams, general manager of the Carnegie Steel Works at Duquesne; F. B. Nimick, general manager of the Colonial Steel Co.; H. W. Brackenridge, capitalist.

La Perla group of properties has been attracting attention. These are situated in the Parral district, about six miles north of the City. The group covers 33 acres, and includes three veins, which run north and south, called La Perla, Diamante, and Danubio. On La Perla there are two new shafts 30 metres deep. A cross-cut, which has not yet reached either wall, shows the vein to be over five metres wide. Mr. Garcia, the owner, states that the ore extracted from the development work has more than paid for itself. The Perla vein is similar to the Veta Colorada of this district, in many respects, and has the same strike. It carries a silicious silver ore. On account of the good showing, all the ground surrounding these properties has been lately denounced.

El Rayo Mining & Development Co. will acquire all properties owned by Wm. V. Pettit near Azules, in the Santa Barbara district, including the Mary mine, held by Long Brothers, under option to Mr. Pettit. It will be remembered that last August, Geo. A. Schroter took Mr. Pettit's properties under option for the Venture Corperation of London. The result of exploratory work proved favorable, and led to the final sale of the properties to the El Rayo Co. In August an adit was started to cut the vein in depth. Later, in October, under the management of G. F. Hutchins, work was hastened with machine-drills. To date there has been 1,800 ft. of cross-

cut done. Four different veins have been struck, and these have added enormously to the ore reserves. The last and most important strike was made in May, and consists of a large body of one-ounce free-milling gold ore. El Rayo Co. expects to connect this adit with its lower workings in a couple of months. Developments during the next year will yield large returns, making this one of the big milling propositions in Mexico.——At Real de las Nogales, situated 60 miles northwest of Parral, and near Pilar de Conchos, a new camp has sprung into existence during the last few months. Nearly fifty years ago that particular locality gave good promise, and a small smelter was erected, which enabled the owners to produce about an *arroba* of silver per day. Before this work was well started the owner died, and from that time no attention was paid to mining. Lately, however, H. J. Repp and Dan E. Phelps have secured some promising ground, and as their prospecting has shown a good body of ore, extensive work is now being planned. The Zaragoza Mines Co., with J. C. Elwell as president, Francisco Chavez as secretary and treasurer, and D. E. Phelps as general manager, is about ready to erect a new smelter to treat the ore on the ground. On 59 *pertenencias* 14 shafts have been sunk, and all have shown ore.

R. J. Watson, of Tonopah, Nev., representing Pittsburg people, has recently closed for the Iberra No. 2, and the Vergara, in the Santa Eulalia district. The Iberra covers eight *pertenencias*, and was owned by Othon Sartorius. The Vergara is about the same size. The deal was made through Cruz Gonzales, of Chihuahua.—— It is reported that Pablo Olivas Prieto has obtained from the State of Chihuahua a concession for a railroad from Jimenez to Allende, both towns in this State; also that the State Government has granted a concession to Jose Maria Botello, of Parral, for the building of a railroad from Parral to San Jose del Sitio, a distance of from 60 to 70 miles.

L. M. Terry, of Chihuahua, and some New York capitalists have recently acquired the Inglaterra and Emma mines of the Chihuahua Investment Co. in the Santa Eulalia, on a working bond. These two properties are situated near the Democracia. The Inglaterra consists of 38 *pertenencias*, and the Emma of 21, or a total of 142 acres.—— The contract for the electric power for the new street railway in Parral, has been awarded to the Parral Electric & Water Co. The rails for the road are on the way, and ground is to be broken on June 1, and the line is to be in operation by December. As soon as the tracks are down, and the sewer and water connections made, the work of paving the principal streets has been promised.——The San Isidro ranch, near Jimenez, owned by Guy Flemming and associates, has been sold to Don Louis Terrazas. The San Isidro is said to be a valuable property, and a high price was paid for it.

The Parral Reduction mill, now under lease to the Parral Power & Reduction Co., has recently changed from steam to electric power, which is furnished from the power-plant of that company. The capacity of the mill has also been increased by the addition of rolls made by the Denver Engineering Works Co.—— The San Cristobal Mining Co. has installed an underground electric hoist. Power is being furnished by the Parral Power & Reduction Co.—— G. H. Keeler is the new manager of the Las Coloradas Mining Co. at Allende, taking the place of J. J. Coggins, whose death occurred recently at El Paso. Mr. Keeler comes from Atlanta, Ga., and will take charge at once.—— The Maria mine, owned by Louis Phelan, and situated in the Roncesvalles district, has been purchased by Parral capitalists, said to be A. Gallardo, J. M. Botello, Pedro Alvarado, F. Ortiz, and Armand Ricaud.—— Albert J. Anderson, chief engineer of the Minas Veta Grande y Anexas, is the new superintendent of the Jibosa and Veta Grande properties of the American Smelters Securities Co. in the Parral district. E. Percy Smith, the former superintendent, has been transferred to the Dolores at San Luis Potosi.—— Recent importations of machinery into the Santa Barbara district, and the milling improvements there are bringing that camp much in evidence. The production is greater than at any time for several years.

Butte, Montana.

The Washoe Smelter.—Its Big Capacity.—The Great Falls Smelter.—Shaft on the Tramway.—Butte-Milwaukee Meeting.—New Copper District.

In one day last month the Washoe smelter at Anaconda treated 10,600 tons of ore, the greatest amount that ever passed through the plant in 24 hours. The average for the month was 9,700 tons, of which 8,100 tons were concentrating ore and 1,800 tons first class. The smelter consumed an average of 16,000 tons of material daily, including ore, coke, limestone, and coal. During the first two weeks of May the smelter was producing 300 tons of copper daily. It is stated that the cost of treatment is equivalent to only 0.65% copper. The old smelter used to lose 1.5% of the assay-value, although before the plant was torn down the loss had been reduced to 0.69%. All the tailing and accumulations of dust, covering a large area about the smelter and stack, and even some of the slag at the old plant has been treated since the price of copper reached 20c. per lb., and good profits have been made out of it. Ten per cent of all the copper turned out by the new smelter is made from the slime, which went to waste at the old plant. As an example of the economy at the Washoe plant, it may be mentioned that the coal ashes are washed and the coal saved thereby nets the company about $400 per day. The other smelter of the Amalgamated Co., situated at Great Falls, produces not quite half as much as the Washoe smelter. The monthly output of the Great Falls smelter is nearly 8,000,000 lb. The April output of the Washoe smelter was in excess of 17,000,000 lb. copper. Both the Washoe and Great Falls smelters are being pushed to their utmost capacity, and the Great Falls plant is being enlarged so that next year it will be able to treat about 1,500 tons per day more than now. The capacity of the Washoe smelter is also, in various departments, being gradually increased. Of course, the copper production is

Montana.

not keeping pace with the output of ore from the mines, because it is the policy of the Amalgamated Co. to treat as low a grade of ore as possible while the price of copper is high; should the price drop, a much higher grade of ore would be mined, in order that the earnings of the various companies might not be reduced.

The shaft being sunk on the Tramway by the Butte Coalition Co. and the Butte & Boston Co., joint owners of the mine, has reached a depth of 1,000 ft., and the new engine, which was ordered last year, is arriving in sections and will soon be in position. The engine will be a duplicate of the one at the Pennsylvania mine and one of the largest in the Butte district. It will be capable of working to a depth of 3,500 ft. The foundation for it has been finished for several months. The Butte & Boston owns two-thirds of the Tramway and the Butte Coalition one-third. The new shaft was sunk as two compartments only, but the third compartment is being raised from the 1,000-ft level. The Boston & Montana Co. has workings under the site of the shaft and is making a connection from the 1,300-ft. level of its workings; the same company is also driving a cross-cut from the Leonard mine, at 1,400 ft. deep, to a point directly beneath the Tramway shaft and will raise to connect with the latter. The opening of the Tramway to a depth of 1,400 ft. will give both the Coalition and Butte & Boston a large supply of ore in the Tramway and Snohomish mines. During the early period of the litigation between the Amalgamated companies and F. A. Heinze, the Snohomish and Tramway were mined by a receiver and a large quantity of good ore was shipped.

A meeting of the stockholders of the Butte-Milwaukee Copper Co. has been called for June 14 in Butte, at which time a board of directors will be elected, and it is announced that the officers of the company will render a detailed statement. The Butte-Milwaukee was organized a little more than a year ago, and its holdings at present are some valuable claims in north Butte, and at Argenta, in Beaverhead county. In the Butte district it owns the Pollock, Colonel Sellers, Bird, and Florence. The company suspended its work on the Pollard, but lessees are working the upper levels. The Pollock shaft is 350 ft. deep, but it is a small two-compartment affair, and it was decided to sink a new shaft on the Colonel Sellers, which is more favorably situated for development of all the company's property. The new shaft is nearly 300 ft. deep, and is a standard three-compartment. The surface equipment is complete and the shaft will be taken to a depth of 1,000 ft. at least.

A new copper find has been made in an old gold district about 11 miles southwest of Butte, and mining men consider prospects good. The district has for years been prospected for gold, but has never been of any importance. Recently Charles Andrieux, a Butte stenographer, and several associates, resumed prospecting on several claims they have owned for years. It was decided to sink a new shaft, and within three feet of the surface they cut a copper-bearing vein, assaying 8%. The seam of ore widened with every foot of depth, and from a few inches it widened to more than a foot in a distance of 10 ft., and the assays increased to 34%. The news of the strike soon reached Butte and within a few days hundreds of prospectors were in the district and the country for several miles was covered with locations. The strike was made on a claim called the Lily Extension, and the outcrop of its vein can be traced for several miles. For several days all the automobiles and vehicles in Butte were engaged by men going to the new district. Sinking on the Lily Extension will be pushed with all possible speed to ascertain whether the copper deposit continues below the water-level.

Denver, Colorado.

Zinc Industry in the San Juan.—The Silver Lake Mill.—The Cripple Creek Adit.—Equipment and Plans.—Copper in Routt County.

With the increase of the importance of the zinc industry of Colorado comes the announcement that the San Juan district is to have a zinc smelter. A plant capable of treating 150 tons per day is to be erected at Rico. The nearest plants at present are at Pueblo and Canyon City, and some of the ores have been sent abroad for treatment. The price of spelter is now above that of lead, and with the stimulus of high prices, and the advantage of a local market for ore, zinc mining in the San Juan region should advance rapidly. The concentrating plant of the United Rico Mines Co. has begun operations and expects to be running at full capacity in the near future. The plant is treating the dump of the Group tunnel and the concentrate is being shipped to Durango.

As an example of rapid construction under adverse conditions the Silver Lake mill at Silverton commands attention. Just a year ago it was burned to the ground. Shortly afterward the reconstruction was started, and the mill was completed within eight months, most of which was in winter. The plant is now undergoing its trial run, and will soon be in full operation.——The bids for the driving of the drainage adit at Cripple Creek have been opened and the lowest proves to be between $20 and $21 per foot. If this bid is accepted, it will make the total cost of the completed adit considerably over $500,000. The signal importance of this deep drainage adit is derived from the fact that it will tap the main watercourse 740 ft. below the present deepest drainage, opening reserves of ore that cannot now be reached. Its portal is in Cripple Creek cañon, about six miles south of the town, and at an elevation of 8,020 ft. From there it will be driven in a northerly direction 14,500 ft. to the workings of the El Paso mine, and, probably, thence easterly 11,000 ft. to the workings of the Vindicator. The funds for the work have been contributed by all the principal companies operating in the district. A shaft is likely to be sunk about 10,000 ft. from the portal, and the heading advanced both ways from this, which, with an average advance of ten feet per day in each heading, will permit the reaching of the El Paso workings in two years. At the portal is installed a Norwalk 12-drill compressor, belt-driven from a 400-volt, 175-h.p. induction motor. Three 50-k.w. Westinghouse step-down transformers take the power from the three-phase, 60 cycle, 6,600 volt, transmission line and deliver it to the motor, lighting-plant, and sawmill. The power is drawn from the transmission line from Canyon City, which transmits at 20,000 volts to Fairview. Ingersoll-Rand 3½-in. drills are used for driving. A most serious problem in the driving of the adit will be the disposal of the waste from the adit, as the cañon is extremely narrow at this point. If it were possible to drive headings from the workings of the El Paso a much greater rate of advance could be gained, but that is impossible, as the workings are now full of water to the 400-ft. level. The smelter at Golden, near Denver, has recently been sold, and, as usual, it is stated that "the Guggenheims" have acquired it.——The Six-Day and Perigo groups of mines in northern Gilpin county have been consolidated under one ownership. The mill belonging to the consolidation is to be re-modeled, and an electric-power plant is to be built at Pactolus.——Large claims are made as to the value of the copper deposits recently discovered in the extreme south-eastern corner of Routt county. It is scarcely to be expected that the real worth will prove as great as that claimed, but it may prove the beginning of the mineral development of that part of Colorado.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

TWO KINDS of dry-crushers are used in the Kalgoorlie district, ball-mills, and Griffin mills. For wet grinding, flint mills and Huntington mills are employed.

THE coefficient of expansion of concrete of the proportions 1:2:4, is 0.0000055 for one degree F., and is almost the same as that of untempered steel, which is 0.0000060.

CONCRETE FLOORS are not well adapted for use around electrolytic or lixiviating plants, because acid solutions attack and gradually disintegrate the cement. However, asphalt coatings will largely prevent this action.

THE sand-wheel is in general use on the Rand, there being a number that are 60 ft. in diameter, capable of raising the tailing from 200 stamps. The first cost is large, but it is reliable and durable and requires a small expenditure for maintenance.

THERE are two principal types of mechanical conveyors, those of the push or drag type, and those of the carrying type. In the former the material is moved forward in a trough, while in the latter it is continuously carried forward on a belt or in pans or buckets.

THE power required to operate a belt elevator is comparatively insignificant. The apparatus itself is in equilibrium, and only such power has to be applied as is necessary to lift the ore and overcome the friction. One horse-power would be ample for lifting 10 tons per hour to a height of 40 feet.

MANY millmen have come to the conclusion that outside amalgamation has proved itself as good as, if not better than, any other method, and it is the method which reduces losses and risks to the minimum. The millman is working more or less in the dark, when employing inside amalgamation.

CORRUGATED SHEET-IRON is one of the cheapest and most useful materials for buildings for metallurgical purposes, particularly for roofs. The corrugations give linear rigidity to light sheets, and render them strong and self-supporting, requiring a comparatively inexpensive framing of steel or timber.

THE sloping belt elevator has an advantage over a perpendicular one, in that it is self tightening. A vertical elevator should have an adjustable foot wheel, to arrange for a proper tension. The head wheel should be over 30 in. diameter, but the diameter of the foot wheel is not of so much importance, except that it should not be so small as to injure the belt.

THE steel-hardening metals are nickel, chromium, manganese, tungsten, molybdenum, vanadium, titanium, cobalt, and uranium, named in the order of the importance of their production and use for steel-hardening purposes. Manganese is produced in large quantities for use in the purification of steel. The minerals from which these metals are obtained are as follows: Smaltite, chromite, wolframite, hubnerite, scheelite, molydenite, wulfenite, rutile, carnotite, and uraninite.

THE opinion was formerly held that the grinding in a tube-mill was done by the balls rolling on the slope of the drum, inside the whirling mass, the ore being crushed between the balls. Experiments have proved that this explanation is wrong and that the tube-mill does not appreciably grind the ore either on the slope or in the interior of the whirling mass, but crushes it by an inclined beating action, and that the higher position of the feed, as compared with the discharge, is of no importance for conveying the material.

THE term phosphate rock as used is applied to several forms of amorphous deposits, consisting to a greater or less degree of phosphate of lime, $3CaO, P_2O_5$. The commercial deposits always carry variable quantities of carbonate of lime and other substances. Trade names have been applied to the several kinds of phosphate rock which are exploited commercially. They are as follows: Hard rock, soft rock, land pebble, river pebble, land rock, river rock, black or blue rock, brown rock, and white rock.

THE only well-attested diamond discoveries in the drift region of the United States during the last four years have been those in connection with the gold washings of Brown and Morgan counties, in southern central Indiana. A full series of specimens of the rocks and minerals found in the gold-bearing drift of this region has been obtained for the purpose of having them compared with the rocks in Canada, north of the Great Lakes, with a view to tracing out, if possible, the source from whence the diamonds came.

COMMON SALT occurs in nature as rock salt, or in solution as brine, varying in strength from that of the ocean, 2.68% by weight, to that of the Great Salt Lake, 18 to 20%, and of the Dead Sea, 22 to 24%, and as sundry subterranean brines of different strengths. Natural salt is almost always somewhat impure, through the presence of small quantities of one or more of the chlorides, sulphates, and carbonates of potassium, calcium, and magnesium. The rock salt of the Holston Valley, Virginia, has been shown to contain 99.55% NaCl; that of Petite Anse, Louisiana, 98.88 per cent.

THERE are four regions where diamonds have been discovered in the United States. These are: The Pacific Coast, chiefly along the western base of the Sierra Nevada, in the central counties of California, associated with gold in the cement gravels; along the line of the moraine of the ancient ice-sheet in Wisconsin, Michigan, Indiana, and Ohio; these have been transported from an undiscovered source, presumably somewhere in Canada, Kentucky, and Tennessee; the Atlantic States from Virginia to Alabama, chiefly along the eastern base of the Appalachians in what is known as the Piedmont region. The actual place of origin of the diamonds is in all these cases unknown.

THE hydrocarbons occur in nature in many forms, and in all conditions, from viscous to solid. One kind or another is found in or associated with the rocks of every geological age, from the Lower Silurian to the Pleistocene. Asphaltic deposits usually are found as impregnated beds intercalated among strata of sedimentary origin, or as limestone containing fossils, or cavities filled with bituminous matter. As a result of local conditions the harder hydrocarbons, like albertite, gilsonite, wurtzilite, and grahamite, are found filling vertical fissures, but ordinarily the asphalt-bearing bed is capped by a bed which has proved impervious to the liquid, which has originated probably, in part, at least, in some lower stratum, and has merely concentrated in the position where now found.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Beaches of Nome.

The Editor:

Sir—If you will look at the issue of this journal, under date of February 28, 1903, you will find a short sketch describing the tundra at Nome. Since then the development of the tundra has been steadily going ahead as outlined in that article, although even the most optimistic resident of Nome did not anticipate that the gold-bearing beaches would prove as numerous and as rich as they have been found.

It appears that the immediate vicinity of Nome has undergone a gradual uplift, varied at one period by a sudden depression, and that these different changes have left the beaches either much higher or lower than the present beach, as the case may be, while the Bering Sea has been steadily receding on account of the debris washed down from the hills.

Already seven beaches have been traced. The first beach found was the present level stretch, which caused the big rush to Nome in the year 1900. The second was found about 3,000 ft. back of the present beach on the tundra, in the year 1903, at a depth varying from 20 to 40 ft. at a uniform level of 37 ft. above the present sea-level on a blue clay bedrock. Very good pay has been found, some claims yielding as much as $50,000. The third was found in the year 1906, close to the foothills, about three miles from the present beach; this one is at a uniform level of 72 ft. above the present level and rests on the hard mica schist bedrock. The depth to the pay-streak is very uneven, in some places a stratum of 120 ft. of clay has to be penetrated before the pay is found. The pay is in sand, exactly similar to the present beach and the gold deposit is at the very edge of the beach, from 30 to 80 ft. wide and from 1 to 3 ft. deep. It is this deposit that has produced millions of dollars and will continue to produce millions for several years to come. The streak has been traced for several miles and the discovery of it last February, on Irene creek, east of Nome river, opens a new area of it for about ten additional miles.

The pay-streak, of course, is spotted, in places rich and in others less so, but the average is most satisfactory. The Portland bench has produced at least $1,500,000, the discovery on Little creek had a streak of pay on bedrock of almost pure gold, the Bessie bench will produce at least $1,000,000, the Halla tract and the Diamond L claims about $500,000, the Bear Cub, the Duplex, the Roosevelt, and the Golden Bull are also claims that will be big producers of gold during the season.

The fourth beach is the one called the Intermediate, which is situated half-way between the third and second beaches; it is at a uniform level of 22 ft. above the present sea and is also called the Clam Shell line, for the reason that the pay is found among petrified clam and oyster shells. The fifth line is between the Intermediate and the third beach and is termed the Flat creek line; it carries coarse gold. The sixth line is situated between the Intermediate and the Flat creek line but not enough prospecting has been done to demonstrate the value of it. The seventh is situated above the third line and is still closer to the foothills, the extent of it is not known. The beaches have been traced rapidly during the past year on account of the same elevation on each line. By taking the levels it is possible to tell with mathematical accuracy how deep one has to sink the shaft to find pay.

However, the bedrock level changes beyond Little creek westward, for land-slides have taken place, which have altered the levels in that vicinity; for that reason the beach-streak has not yet been picked up beyond Little creek, but it is bound to be found and must be immensely rich, because the hinterland has some creeks that have produced big money.

In the Solomon district the beach-lines appear to be on different levels; the uplift must have been higher. Some good indications are being found on Jerome creek and before the summer season arrives there is no doubt that several miles of gold-bearing gravel will be discovered in that direction.

If the output of the mines had not been reduced on account of the labor strike, this would have been the best winter season Nome has ever had, as far as the output of gold is concerned, at any rate, the gold production this year from the Nome region should reach about $10,000,000, as compared to $7,000,000 last year.

It will be several years hence before the gold output from Nome will decrease; for at least five years more the beaches alone should make Nome a prosperous and lively camp.

OTTO HALLA.

Nome, Alaska, March 4.

Powder in Blasting.

The Editor:

Sir—As every little helps, especially in mining, where there are often many different ways of doing the same thing, the following regarding the use of powder in blasting may be of some aid to mining men. Powder is an important item in the expense account of a mine and it is greatly misused and wasted. The careless handling of it is also in evidence. Lack of facilities or willful neglect in thawing frozen powder result in the ineffectiveness of much that is used. When frozen its breaking strength is in a great measure decreased and in this condition it is, likewise, more dangerous to handle. I have seen miners, so-called, break in two with their hands a stick of giant powder, frozen as hard as a rock. It can be safely thawed by placing it in tubes, themselves immersed in circulating, or still, water heated to the right temperature.

When employed for charging holes, there seems to be a marked tendency to use too much. Holes are often charged to the collar, especially when a miner has a 'short round' and thinks that by so doing he can make a better showing. I have repeatedly observed that a good miner, one who breaks the most rock, will charge his holes only about one half, and I have seen it proved that a hole thus loaded will 'break' as well and with much less gas thereby generated, as when loaded to the collar. These gases generated by the powder—after explosion—are rightly dreaded by miners, and consideration thereof is most important. Furthermore this generation of gases is precisely the result—and about the only one—obtained by ramming a hole full of powder, or, as is common, by tamping it with the powder. The general belief, underground, that tamping the hole will keep out air, thereby increasing the efficiency of the powder, is not entirely borne out in practice. Another matter, which seems to call for a difference of opinion, is priming a hole. Should the primer be put in first in the bottom, in the middle, or last, or where? It is immaterial, for it will explode the powder as well in the bottom as in the middle. It would appear possibly safer to put the primer in last, as it would not then be subjected to so much tamping, but with an inferior quality of fuse there might be less chance of a 'burnt hole,' if it were put in the bottom. In wet holes (to avoid mis-fire) it is best,

even after having well greased the primer, to put it in at the last.

As for tamping down the powder with an iron cleaning rod or a drill, that speaks for itself! But I have seen it done, and the excuse given for it was that so-and-so, a good (?) miner, did it. In brief, if a stick of powder be more than needed, it should be cut in two with a knife, not broken. While the use of too long a fuse is not to be especially censured, the excessive use of powder, besides being wasteful, is the cause of many a 'powder headache' and has even more serious consequences, due to the gases thus generated, particularly in a mine, or in different parts of a mine, where there is poor circulation of air. Powder, when frozen, should not be used; if there be no other means at hand of thawing it, sit on it for a bit.

A. L.

Oakland, California, May 9.

On Technical Writing.

The Editor:

Sir—Your article entitled 'On Technical Writing,' under date of March 23, has only just come to my notice, owing to my absence abroad, and as nearly 25 per cent of the selections from the Proceedings of the Institution of Mining & Metallurgy refer to me, I am under the painful necessity of having to enter the arena with you, and I hope to crush you under the avalanche of my just wrath.

Taking your criticisms as a whole, I think that they are given up too much to mere abuse and caustic sarcasm, which is not argument and proves nothing, except your own command of the English language, and suggests the probability that you were suffering from a bad liver when you wrote the article in question. If it is only a matter of liver, I can sympathize with you.

However, in extenuation of any faulty English which may be contained in the remarks, from which you give extracts, I would point out that you are quoting from verbal discussion, delivered at a meeting of the Institution, and I think it is patent from the text that such discussion was extempore; consequently, the subject matter is hardly appropriately discussed under your heading, 'On Technical Writing.' If you write a skit 'On Technical Talking' I may plead guilty to being within your jurisdiction.

You seem to be particularly wrought up regarding the use of the adverb 'very.' Personally, I think that most people do distinguish between things that are "more or less, very, or somewhat exceptional," and I will give an illustration to prove it. If a man came into a mining engineer's office and offered him a good fee to make an examination of a property, and the mining engineer refused the fee on the plea that the pay was too high, we should describe the case as *exceptional*, and if the mining engineer, not content with that, turned on his client and abused him, for voluntarily offering such big fees to professional men, and said it was idiotic to establish such a bad precedent, then, Mr. Editor, I should say the case was *very* exceptional, and likewise *very* peculiar.

You object to the use of the word 'proposition,' which you describe as a vulgarism. Your criticism is abuse and your argument not convincing. Your suggested synonyms are all less appropriate than the word you villify.

Wherein, Mr. Editor, is the mock modesty in the use of the indefinite pronoun 'one,' and wherein is the haziness in the expression you criticize. The sentence is grammatical, conveys clearly the meaning intended, and, as for the style, that is merely a matter of taste. The pronoun 'one' is an expression of *true* modesty on the part of *one* who cannot take refuge behind the high-sounding editorial 'WE.'

As far as technical writiug in general is concerned, my opinion is that mining engineers as a class start life with a poor education in the English language; then they spend a number of years in surroundings that tend to weaken their hold on the subject; and it is only when they attain positions of responsibility that they feel the need of a ready pen. But the attainment of fluency does not always bring with it a thorough grasp of the rules of grammar and orthography, and even among the small percentage of 'literary' engineers there remains a great deal to be desired in the direction of style, diction, and grammar. I do not think that your thunder will do any good, because the average engineer finds his life too much occupied in other directions to worry his head about whether what he writes would pass for its literary excellence. He is satisfied with saying what he has to say, in a manner that will be understood by his readers. I do think, however, that a great deal could be done by the editors of the publications of the technical societies. A number of faults you point out could be avoided by more careful editing, and no author would object to proper punctuation or the proper abbreviating and hyphenating of words.

C. S. HERZIG.

London, May 9.

How to Wild-Cat.

The Editor:

Sir—Get a claim near some mine, give it a name that can be mistaken for the adjacent property, leave a man there well supplied with telegraphic funds with instructions to use them prodigally; experience of mining is not necessary, provided he is prolific in mining lore, big imagination, and careless of telling the truth; form a company, get a lot of certificates printed, engage two or three brokers as fiscal agents and instruct them to go the gait; supply them with all the probable possibilities of your mine becoming a bonanza; in case of a lull in sales instruct your man at the front to make a strike, and in case he fails, discharge him for incompetency; in replacing him be sure to get a man incompetent as to mining, but well versed in geological gab; and just before your promised dividends are due let the control pass to someone else on whose shoulders you can shift the responsibility.

J. C. CLARK.

Goldfield, Nev., May 21.

Secondary Enrichment.

The Editor:

Sir—Your comment in the issue of May 11, referring to Mr. Hiram Hixon's suggestive contribution, brings out an important point, which seems to find substantial proof in the Cobalt ores, namely the *indirect* action of carbonaceous matter as a possible precipitating agent. Sections of ore from Cobalt sometimes show small grains of sulphides, with an incrustation of metallic silver. Is not this strong evidence that, although the carbon may have been indirectly responsible by precipitating iron sulphide from sulphate waters, the sulphides are the immediate precipitating agents of the precious metals?

D. F. C.

Redding, Cal., May 18.

IN winning the precious metals in Colorado, considerable quantities of argentiferous manganiferous iron ore are obtained, which does not carry a sufficient amount of gold and silver to make it valuable on that account, but because of its iron and manganese content is available as a flux in the smelters.

Tonopah, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By a Special Contributor.

Tonopah was discovered in the spring of 1900. It is now considered the metropolis of the desert. Substantially built, with water and power transmitted many miles, this settlement is now the centre of the highest engineering talent in Nevada. Its mines are well equipped and most of the undesirable characteristics of the mining camp are comparatively suppressed. Mills will soon be treating a tonnage that will give the camp a period of remarkable prosperity.

In April of 1900, James L. Butler left Belmont to prospect in the district south of the site of Tonopah near the old camp of Southern Klondyke. On Mispah hill, he noticed the outcrops of the Burro veins, and took samples. These, like so many of the rich outcrops of Nevada, showed little to attract attention and were overlooked for a time and then thrown away by the assayer. Returning to Belmont, Butler broke off more specimens, which he handed to T. L. Oddie, on the understanding that the latter was to get an interest in the find, if he got them assayed. Oddie was then a lawyer in charge of the Stokes mine at Austin. The samples proved surprisingly rich. Butler and Oddie hastened to the discovery. It was in August that the claims were located and two tons of sorted ore were shipped while the location work was being done. This was sold for $600 and from that time the mine has paid for its own development. During 1901, the mines were given over to lessees, who probably extracted about $4,000,000. In 1902 the Tonopah Mining Co. entered the field. At this time the desert was covered by the excited population of a new mining camp. In the centre of the town, rich ore was struck in a shaft sunk in an unmineralized volcanic rock. Prospectors and promoters quickly took advantage of the find. Claims far away from real discoveries were in demand. Shafts were sunk in many places. Some were the honest investment of earnest men, many were desperately forlorn hopes, and still more were common swindles.

Rich ore was found at considerable depth by sinking through the barren andesite near the known producing area, notably at the Montana Tonopah, Desert Queen, and Tonopah Extension shafts. The geological features soon became well understood and in 1903 the gambling element found another field; the period of reckless and feverish excitement was at an end.

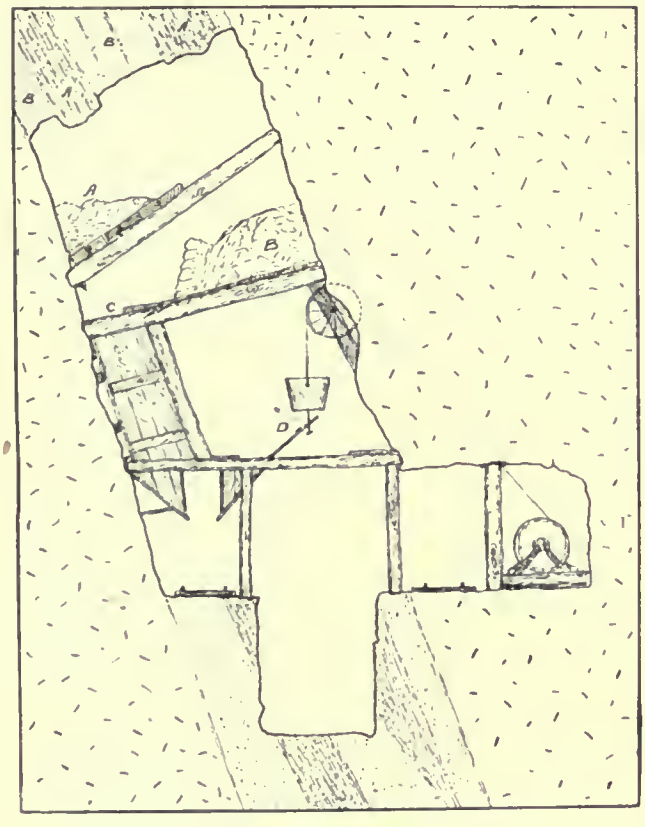
Tonopah has all the appearance of a mining town that depends upon the intrinsic value of its mines rather than living on the ephemeral prosperity resulting from wild speculation. The floating population, with all its unsavory attendants, has come and gone, and the mines are largely in the hands of companies that are exploiting them with the help of the best engineering talent. The town is situated in the foothills, the monotony of the desert being broken by the steep volcanic buttes. The camp is a pleasant contrast to the boisterous activity of Goldfield. Tonopah has assumed proportions commensurate with its industry, and is now settling down to work its mines with the utmost economy that the distressing conditions of the desert will allow.

The Tonopah of Nevada and the Montana Tonopah are the principal companies operating in the camp and they are now making every effort to overcome the trying conditions, and treat their low-grade ores on a large and economic scale. At the Montana Tonopah, high-grade ore has been shipped in sufficient quantities to pay the cost of development and the construction of the mill, which is now nearing completion. No attempt has been made to increase the production beyond this point, and the wisdom of this policy is self-evident. The cost of sorting, freight, and smelting last year was $19.30 per ton, whereas it is estimated that the ore will be milled at Tonopah for $3 per ton. The shipping ore averages $50 to $60 and is largely treated by the smelters in California, where it is used for fluxing the highly basic ores of Shasta county. For this purpose it is not altogether satisfactory. The quantity of fine made by the samplers and the high percentage of alumina are detrimental to blast-furnace work, the former necessitating screening and briquetting, while the latter thickens the slag and prevents an easy separation of low-grade matte. Careful mill-tests have been made and a mill is being erected near the shaft. Water will cost $1 per 1,000 gal. and electric power $8 per h.p. per month. A plant to crush in two stages is being erected at the shaft immediately below the steel ore-bins; this will consist of one No. 5 and two No. 3 gyratory Gates crushers, which will break the ore

Montana-Tonopah Mill in Course of Construction.

to ¾-in. ring. From here the ore will be elevated by a belt-conveyor to the mill-bins. The ore will be crushed in a 40-stamp mill to 12 mesh and it is expected that 150 to 200 tons will be treated per 24 hours. This product is to be classified, the coarse material passing to eight Wilfley tables, while the slime and fine, together with the tailing from the Wilfleys, go to two Dorr classifiers, which precede the tube-mills. The latter will grind the coarse product to 150 mesh. The re-ground material then forms the overflow from the Dorr machine and the whole product will pass to two large cone-classifiers. The underflow from these cones goes to 16 Frue vanners and the overflow joins the stream of tailing from the vanners and runs to the settling-vats in the cyanide plant.

From the settlers the pulp is taken, as required, to the agitators, of which there are six of the Hendryx type.



Method of Mining.

After agitation in a cyanide solution, the pulp is drawn off to a large reservoir, where it is stored for filtering by means of the Butters vacuum filter-press. The gold and silver-bearing solution recovered from the Butters filter will be precipitated on zinc-dust in the Merrill precipitation-press, which has been so successfully used at the Homestake mine.

The mine is at present being prepared for a large output of milling ore. For this purpose chutes are being put in at 20-ft. intervals in the principal orebodies and preparations are being made to handle the ore-dumps at low cost. These will be drawn down in raises put up from the adit-level to the bottom of the dumps. The ore will be loaded in cars from these chutes and hoisted through the main shaft. A complete equipment is now installed for a constant and large supply of ore. Ample ore reserves are blocked out with chutes and bunkers for economic handling. A double-deck cage will be used with a counterbalance; a complete reserve hoisting and compressor plant, driven by a steam engine, is in place. The equipment is a double-drum double-cylinder 15 by 18-in. hoist driven by compressed air. The compressor, which is a 12-drill Ingersoll-Sergeant, is driven by a 200-h.p. motor, the power being supplied by the Nevada Power & Milling Company.

The arrangements for sorting ore in the stopes is shown in the accompanying diagram, together with the method of sinking a winze. In the vein there occur bands of shipping ore *A*, alternating with material of milling grade, *B*. These are separated underground, the shipping ore being broken down on a platform, from which it is shoveled to the chutes. The milling ore, generally below $50 per ton, is held in the stopes, as indicated. At *D* is shown an automatic dumping device, by which the hoisting engineer can empty the ore into the chute. The necessity of working out this shipping ore and leaving large quantities of milling ore in the stopes has made economic mining an impossibility. In few places has the vein been completely stoped. Generally the walls are strong and the amount of timber required will not be excessive when the milling ore is removed in a systematic way. Timber and fuel supplies are quite inadequate to meet the demand. Fire-wood is now $35 per cord, lumber $50 to $60 per 1,000 ft. and coal $37 per ton, but the price is not as serious as the scarcity of material. Several of the mines have been shut down or crippled by the fuel situation. This is one of the most important problems to be solved. The lack of locomotives and shortage of supplies prevailing in the West is only accentuated in this district.

More serious, however, are the relations between capital and labor and the prevalent tendency to make indefinite compromises. The conditions are better at Tonopah than elsewhere in Nevada, but they are serious none the less. It will require the utmost diplomacy from the Governor of the State to the Dago mucker to avoid a situation as serious to the miners as to the operators themselves.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A fragment of Andesite was sent from Wallace, Idaho, by A.

The black mineral sent by A. C. W., of Randsburg, Cal., is Hornblende.

A Rhyolite Pumice stained with Iron was sent by T. R. from Los Angeles.

C. S. V., of Daggett, Cal., sends: No. 1, Dacite; No. 2, Andesite; No. 3, Andesite.

We named the rock sent by O. H., of Bodfish, several weeks ago. It is a ferruginous sillimanite Schist.

The specimens from F. G. C., Silver City, New Mexico, are: No. 1, Sandstone; No. 2, Specularite, Quartz, and Limonite.

The specimen of Clay sent by C., of Chittenden, Cal., carries considerable sand and is not a high-grade clay. It might do for brick.

The specimens sent from Casa Grande, Ariz., by W. J. F., are: No. 1, Andesite; No. 2, Andesite; No. 3, Andesite; No. 4, Pectolite and Garnet.

B. G. sends from Ydalpom, Cal.: No. 1, Andesite; No. 2, Andesite Tuff; No. 3, Andesite; No. 4, Rhyolite Tuff carrying Pyrite; No. 5, Andesite; No. 6, Andesite; No. 7, Andesite carrying stringers of Quartz.

Phosphate Deposits in the West.

By F. B. WEEKS and W. F. FERRIER.

*Within the last few years it has been found that the Upper Carboniferous rocks of the central Cordilleran region include a series of oolitic beds containing phosphates. These beds are known to occur over a considerable area in southeastern Idaho, southwestern Wyoming, and northeastern Utah. Prospecting has been carried on at a number of widely separated localities.

In Idaho the beds outcrop along the Preuss range, extending from the line of Bannock and Bear Lake counties in a southeasterly direction along its west face. A probable southern extension of these beds near the Idaho-Utah line is found on the mountain slopes east of Bear lake, where the overlap of upper Mesozoic sediments has been eroded. East of the Preuss range, in the Sublette range in Wyoming, are similar beds which follow the southerly trend of this range to Smiths Fork.

The mountains rise 1,500 to 3,000 ft. above the intervening valleys and the region is drained by Bear river and its tributaries. The Oregon Short Line railroad follows the valley of Bear river and affords the only means of transportation to market. At present only those beds that lie nearest the railroad shipping points are being worked. In Utah the phosphate series has been found south of Bear lake, in the vicinity of Woodruff. The beds also outcrop in Weber cañon, about 1½ miles below Croydon, and in some of the side cañons. None of these beds are being worked at present. The Union Pacific railroad, which follows the course of Weber river, will make possible a rapid development in this region.

Beds of good grade, but too thin to be profitably worked, have been observed at other points in these States and also in Nevada. It is highly probable that further exploration will show that these oolitic phosphate beds have a still wider distribution.

Many substances have been mistaken for the phosphate, notably some of the fine-grained, loosely bedded, dark-gray ash rocks commonly associated with the lavas of southeastern Idaho and other places. These ash rocks are as a rule much lighter in weight than the phosphate.

The accompanying map shows the areas of Upper Carboniferous rocks, of which the phosphate series forms a part, and of the overlying and underlying strata of this region; also the position of the deposits of economic value.

As the phosphate series occurs within the Carboniferous rocks, a more detailed description of these strata will be given. They outcrop in eastern, central, western, and northern Utah, southeastern Idaho, and adjoining portions of Wyoming, and in northern Nevada. Their lithologic characters are persistent, and the three subdivisions may be recognized in the above-defined area.

The limestones that form the lower division are generally massive and occur in bold and precipitous outcrops. In many places they are coarse grained and weather rough and in dark colors. They are also rather silicious and contain some cherty layers and masses. This division is 2,000 ft. thick. At the top of the limestones the beds become sandy and the quartzite series generally begins with an alternation of sandy limestone and sandstone, and continues through several hundred feet of sandstone weathering red and yellow. These are succeeded by yellow, white, and gray sandstones and quartzites, the upper half of the series being quartzite, readily recognizable as such. This quartzite in most places grades into a dark, rather coarse granular limestone—the Upper Coal Measures limestone of the Fortieth Parallel Survey. The upper part of this formation consists of yellow sandstone and sandy limestones, which grade into a blue-gray compact limestone just beneath the phosphate beds. In these blue and gray limestones indistinct fossils weather out on the surface, but are difficult of determination. This portion of the section varies considerably in the character of sediments.

The phosphate series consists of alternating layers of black or brown phosphatic material, shale, and hard blue or gray compact limestone. The limestone is in the main fossiliferous, containing well-preserved forms of *Rhynchonella*, *Chonetes*, *Omphalotrochus*, and *Productus*. The shale contains *Lingula* and lamellibranchs. The series is in places about 90 ft. thick. The beds vary in thickness from a few inches to about 10 ft., but where of extreme width they are broken by thin layers of shaly material poorer in phosphates. At the base the series begins with limestone, and as a rule 6 to 8 in. of soft brown shale overlies this basal limestone. Above is the main phosphate bed, 5 to 6 ft. thick. This is almost entirely oolitic in structure and high in phosphates. Several other beds, varying in thickness from a few inches to about 10 ft., separated by 6 to 24 in. of limestone or shale, occur in the series. The beds of extreme thickness, as already mentioned, contain seams of shaly material, itself phosphatic, too thin to be separated from the pure oolitic material in mining. All the sections that have been examined show one, and some of them two, beds of commercial value.

The beds rich in phosphates are overlain by a coarse-grained, locally brecciated limestone, for the most part in massive outcrops. Above this limestone is sometimes found 100 ft. of nearly white limestone, but as a rule it is succeeded by the series of blue and gray limestones containing large spirifers and *Productus*. Next above is a series of red sandstone and shale containing brachiopods and lamellibranchs. Still higher in the section is a considerable thickness of blue, gray, and greenish limestones, which form the upper part of the Upper Carboniferous series, and in the Montpelier region there are silicious limestones and red sandstones containing *Ammonites* and other fossils of Lower Triassic age.

The succession of strata in the range east of Montpelier, Idaho, is, in places, broken by folding and faulting and where this is the case the structure is difficult to follow, since not only does the faulting vary in amount of displacement, but the beds, particularly on the west side of the fold, contain numerous rolls, which cause both the strike and dip to vary within short distances. The intense compression to which these beds have been subjected has produced a remarkable fracturing by which they appear to be on edge, with a general north-south strike. The dip, however, is to the west at angles of 20 to 30 degrees.

In the cañon of Montpelier creek the lowest beds exposed are yellow sandy limestone and sandstone and blue-gray silicious limestone, which immediately underlie the phosphate series. The overlying limestones generally occur in massive outcrops. A prominent spur of the range extends nearly to the town of Montpelier and is formed of limestones and sandstones of Upper Carboniferous and Mesozoic age. The lower portion of the Upper Carboniferous series, including the phosphate beds, is exposed on the north side of Montpelier creek. On the south side of the creek the phosphate series is buried beneath the detrital slopes, and the outcrops of the phosphate beds are exposed only in the numerous draws that cut across the strike along the range. Between these points the beds are not visible except where exposed by development work, particularly on the Waterloo placer-mining claim. Their presence, however, is indicated by pieces of float and the characteristic darkening of the

*Abstract from 'Contributions to Economic Geology,' 1906, Part I. United States Geological Survey.

soil overlying them. Here the beds dip to the west at a low angle—about 20 to 30°. They are remarkably uniform in character over a wide area, rolling slightly, but showing no signs of serious disturbance. Erosion has removed the upper beds from a large portion of the ground, leaving areas in which the main phosphate bed is now covered by only two feet of limestone and a few feet of shale and surface detritus. Here and there the top of the phosphate bed itself forms the surface of the ground and in places the bed has been completely eroded, leaving only the hard underlying cherty limestone. The band of limestone already referred to, which immediately overlies the main phosphate bed, is locally shattered in a remarkable manner without displacement, the phosphate bed beneath being but little affected and both limestone and phosphate retaining their usual dip.

From a practical standpoint the limestone immediately overlying the main phosphate bed at Montpelier is of

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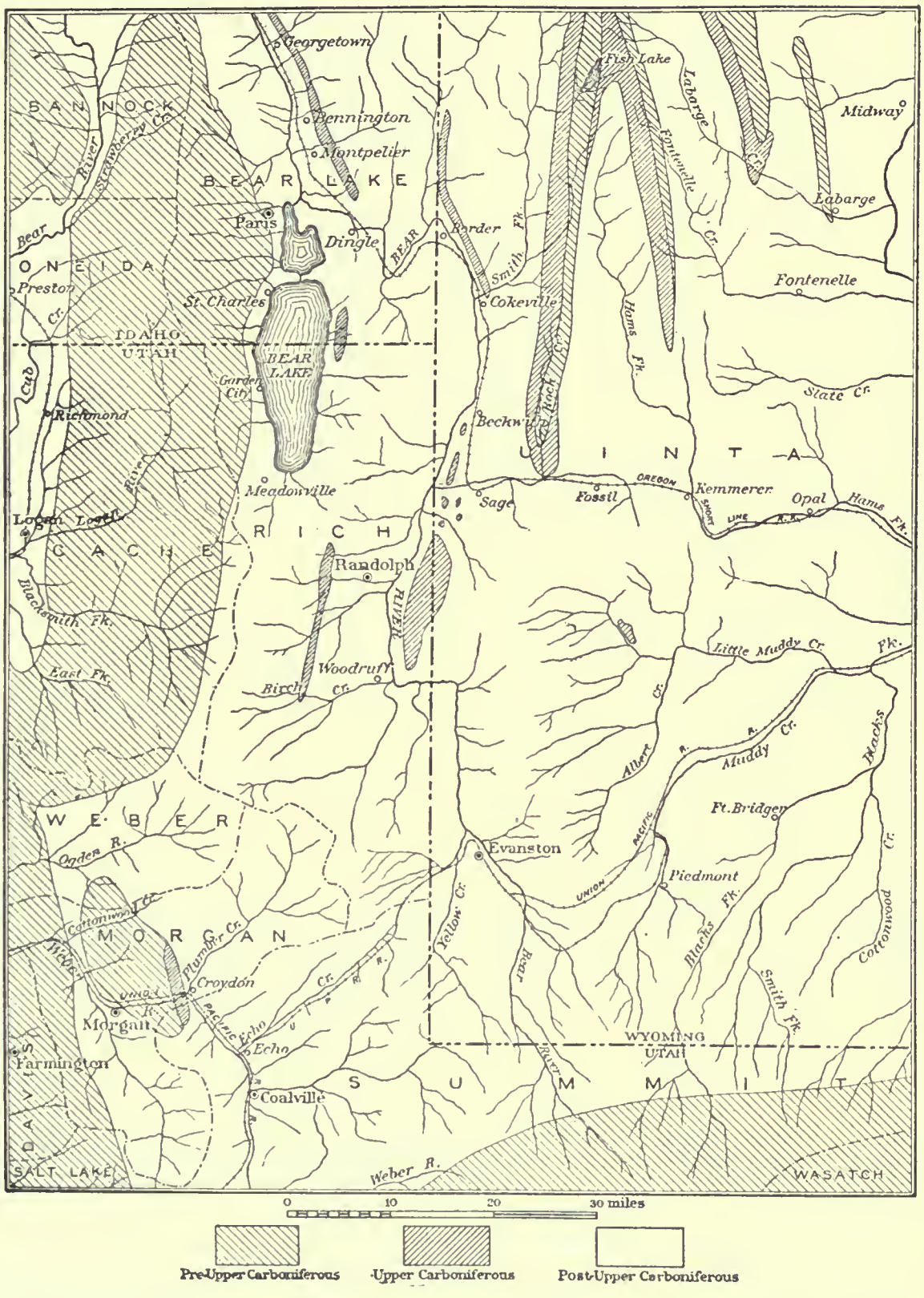


MAPS OF PARTS OF IDAHO, WYOMING, AND UTAH, SHOWING LOCALITIES OF UPPER CARBONIFEROUS ROCKS CONTAINING PHOSPHATE BEDS.

Compiled from field notes and published maps.

importance, being uniform in character wherever found and containing abundant specimens of a coiled shell, *Omphalotrochus*, which seems to be confined to this bed. This limestone or 'cap lime,' as it is called by the miners, is a valuable landmark in prospecting for the main bed of phosphate. It averages two feet in thickness, is dark gray in color, and hard when freshly exposed, but rapidly weathers brown and finally disintegrates completely. Large blocks of it which have lain on the ground less than two years crumble to pieces when struck lightly with a hammer. In common with most of the other bands, it emits a strong bituminous odor when broken. Analyses show that some of these limestones contain several per cent of P_2O_5. In development work the position in the series of some of the beds can readily be determined from their fossils, even by one with no knowledge of paleontology.

The main phosphate bed is the lowest one in the series at this locality and is just over the basal limestone, which contains much silica, in many places segregated as irregular bands and masses of chert. The phosphate layers are black to brownish in color and finely to coarsely oolitic in structure.

The beds, rich in phosphate, are almost entirely oolitic, the small black granules being densely packed together with but little matrix material and effervescing but very slightly with hydrochloric acid. The phosphate has a bituminous odor when freshly broken. As the number of oolitic grains, and therefore the phosphate content, decreases, the beds assume more of the character of oolitic shale or limestone.

Several thousand tons of phosphate from the main bed at Montpelier, the whole of the material 5½ to 6 ft. wide between the inclosing limestones being mined and shipped, showed a remarkably uniform content, the average of a large series of analyses on carload lots giving a total of a little over 32% P_2O_5, equivalent to 70% bone phosphate. As the result of a careful experiment, it was found that a cubic foot of the phosphate in the main bed weighed 150 lb. This gives 13.3 cu. ft. per ton.

The stratum varies considerably in hardness, the lower two feet being very hard and blocky and the upper portion being softer, with a more shaly structure.

In early days the dark shales associated with the phosphate were, owing to their bituminous odor, frequently taken to indicate the presence of oil or coal, and the deposits at Montpelier were filed on as coal lands and considerable work was done in the effort to find that material.

As the dip is low at this place, the beds are worked as an ordinary flat coal seam with pillar and stall. The phosphate is mined by both open-quarry and underground workings. A loading platform is placed at the foot of a gravity tramway running up the slope of the hill, the top of the platform being on a level with the main adit. The phosphate rock is delivered at the platform in ordinary cars from both quarry and mine and loaded directly into the wagons through a chute. It is then hauled about 4½ miles to the Oregon Short Line at Montpelier and dumped into the cars through a door in a loading-bridge built over the siding. It is now being shipped to the works of the San Francisco Chemical Co. at Martinez, Contra Costa County, Cal., and there made into superphosphates to be used as fertilizers.

The discovery of these phosphate beds has opened up a new industry in the West, the future of which is largely dependent on the granting of such rates by the railroads as will enable the manufactured product or raw material to be sold in Australia, Honolulu, Japan, and the Middle States, the home market on the Pacific coast being at present too limited.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Where an oil and gas lease could be terminated at the end of any year, and prior to the finding of oil or gas in paying quantities, only by the giving of notice a reasonable time before the expiration of such year, it was held that the burden was upon the lessor to prove that the time between the giving of the notice and the expiration of the year, was a reasonable time within which to ascertain whether oil or gas in paying quantities could be found.

Campbell *vs.* Rock Oil Co., 151 Fed. 191.

Purchasers of interest in mining property for a stated sum promised to pay the stated sum in addition as they should receive net earnings, either in association with the vendor or through a corporation succeeding to the ownership and further promised that within a specified time they would begin development of the property with a specified force of men until the additional amount should be paid. A bond was given to secure the performance of the contract and the payment of the additional specified sum. In an action on the bond it was held that the bond created an obligation to pay such stated sum only if it was received out of the net earnings, and that the sum stated was a penalty, and that the penalty could be recovered only on proof that if the mines had been worked the purchasers would have been able to earn the stated amount or some part thereof.

Bluwett *vs.* Hoyt, 103 N. Y. S. 451 (March, '07).

The statutes of Arizona prescribe the manner in which the re-location of a forfeited or abandoned lode-claim shall be made, and also declare that the location notice shall state if the whole or any part of the new location is located as abandoned property, otherwise it should be void. Under these statutes in an action to quiet title the Court held that the word 'void' meant 'voidable,' and that a location notice, defective in that it failed to state that the claim was located in whole or in part as an abandoned claim, might be amended to comply with the statute in the absence of intervening rights.

Kinney *vs.* Lundy (Ariz.), 89 Pac. 497.

In an action to determine the rights of respective claimants to a mining claim under the United States statutes, the complaint must contain a definite description of the particular area in conflict that might belong to each of the adverse claimants, and the judgment following the pleading must also designate the particular part of the area in conflict belonging to each of the adverse claimants.

Smith *vs.* Imperial Copper Co. (Ariz.), 89 Pac. 510 (March, '07).

A quit-claim deed of the coal and minerals under certain land was held to be ineffectual to convey any interest in the coal where no consideration was named. That such a deed after the lapse of 25 years, where there was no severance of the coal from the land, was not good as against a deed from the heirs of the original grantor.

Redmond *vs.* Cass (Ill.), 80 N. E. 708 (Feb., '07).

In a prosecution against miners for "intentionally" entering a mine against caution, and for injuring the shaft of the mine, it was held that the word "intentional," as used in the statute, only required that the act constituting the alleged violation of the statue should be "knowingly" done.

Koppla *vs.* State (Wyo.), 89 Pac. 576. (April, '07.)

Where a miner was injured while riding in a car in a shaft of a mine, the question whether such miner went into the mine in obedience to the directions of the mine superintendent, was a question of fact to be determined by the jury.

Burns *vs.* Old Sterling Co. (N. Y.), 80 N. E. 927. (April, '07.)

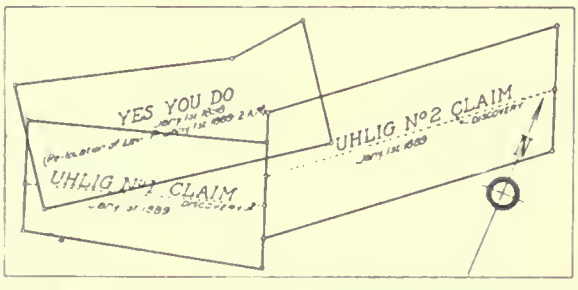
A Celebrated Case.

Written for the MINING AND SCIENTIFIC PRESS
By HENRY M. HOYT 2ND.

Having read in your issue of February 16, 1907, some comments upon the effect of a case decided by the United States Supreme Court on May 29, 1905, Lavagnino *vs.* Uhlig, 198 U. S. 443, I beg to submit my views upon the opinion of the Court as pronounced by Mr. Justice White. My purpose is to ascertain as far as possible to what extent the case may be considered as binding authority in future cases, both from the standpoint of the actual miner locating mineral claims upon the public domain, and from the standpoint of the mining lawyer who is called upon to advise his clients as to the validity of rights acquired by such locations.

The controversy related to locations whose surfaces were in conflict and was confined to the parts in conflict; hence the conclusions reached apply alike to lode and placer claims. In relating the facts I shall omit, as did the Court in its opinion, all those things which were laid aside as unnecessary, confining myself to those things which purported to rule the case. Eliminating extraneous matter therefore, the facts were as follows:

Uhlig and McKernan on January 1, 1889, located two claims named Uhlig No. 1 and Uhlig No. 2, more than seven acres of which at the time of the location overlapped a prior valid subsisting location known as the Levi P. The owners of the Levi P. continued to perform



annual labor up to and including the year 1896. They failed to perform annual labor in 1897. On January 1, 1898, one Smith re-located the ground formerly known as the Levi P. and named his re-location the Yes You Do. In August, 1898, the owners of the Uhlig No. 1 and Uhlig No. 2 filed application for patent. Lavagnino, the then owner of the Yes You Do by grant from Smith, filed an adverse claim. This action was brought in a district court of Salt Lake county, Utah, to determine the right of possession to the conflicting area. The trial court and the Supreme Court of Utah dismissed Lavagnino's action and upheld the Uhlig locations *for various reasons*. The Supreme Court of the United States on writ of error affirmed the judgment and based its conclusions upon *one reason only*, namely, "that at the time when Smith located the Yes You Do claim as a re-location of the Levi P. claim, the land embraced within the location notices of the Uhlig claims, and upon which the Yes You Do overlapped, was not unoccupied mineral lands of the United States, and was consequently not subject to be re-located by Smith." (198 U. S. at p. 157.) It is made plain in the preceding pages of the Court's opinion that the Court proceeds upon the theory that the forfeiture of the Levi P. for failure to perform annual labor did not cast the claim into the public domain subject to re-location, but did cast it into the junior conflicting locations Uhlig No. 1 and 2.

It is respectfully submitted that a serious mistake in law and logic was here committed by the writer of that opinion, and my reasons for so believing are as follows:

On January 1, 1898, the situation of the Levi P. location was this: Under the provisions of Sec. 2321 the owner of the Levi P. could have resumed work and thus saved the claim from forfeiture; or, in default of such resumption and in compliance with R. S. Sec. 2324, any qualified person could enter and re-locate the claim "in the same manner as if no location of the same had ever been made." This was done by Smith, who re-located it as the Yes You Do.

It is conceded in the opinion of the Court, at page 452, "that the Levi P. location, of which the Yes You Do purported to be a re-location, was prior in date to the location of the Uhlig No. 1 and 2." Under R. S. Sec. 2322, so long as the owner of the Levi P. complied with the laws of the United States, he had "exclusive right of possession and enjoyment of all the surface included within the lines" of his location.

This is the ground upon which a location made a few days before the prior locator's time to do annual labor had expired (in the case of Belk *vs.* Meagher, 104 U. S. 279-283) was held absolutely void, and one would suppose that under the statute the nullity of the proceeding would be complete, whether the premature location went to the whole or to a part of the claim. Nevertheless we find the Court in the Lavagnino case ascribing to the locator of the junior overlap laid upon a subsisting valid prior claim a sort of inchoate or "eventual right"—a right to intercept the title to such overlap in case its owner should abandon or forfeit his original, prior, and "exclusive" right thereto, thereby preventing its reversion to the public domain in accordance with the view formerly entertained as to its destiny in such circumstances. Attention should also be directed to the fact that no forfeiture is complete for failure to do annual labor until a qualified locator has, after the expiration of the year, re-located the premises. [Revised Statutes, Sec. 2324. 'Lindley on Mines;' Sec. 643, second edition.] Applying this doctrine to the facts and conclusions of the Lavagnino case, we are confronted by the startling discovery that not until someone *attempted* to re-locate the Levi P., and thereby made the forfeiture complete, did the overlap fall into the hands of the owner of the Uhlig No. 1 and 2, thus changing his "eventual" right into a right of present enjoyment.

But these are only minor difficulties. The real trouble comes on page 456, where the Court concludes that, because a junior claimant gets the ground in conflict if the senior claimant fails to adverse or to duly prosecute his adverse claim, therefore, "as the greater includes the lesser," a like result follows the senior claimant's forfeiture *before* an application for patent by the junior claimant. Quoting from the opinion:

"It cannot be denied that under Sec. 2326, if, before abandonment or forfeiture of the Levi P. claim, the owners of the Uhlig locations had applied for a patent, and the owners of the Levi P. had not adversed the application, upon an establishment of a *prima facie* right in the owners of the Uhlig claims, an undisputable presumption would have arisen that no conflict claims existed to the premises described in the location notice. Gwillim *vs.* Donnellan, 115 U. S. 15, 51, 29 L. ed. 348, 350, 5 Sup. Ct. Rep. 1110. And the same result would have arisen had the owner of the Levi P. adversed the application for a patent based upon the Uhlig locations, and failed to prosecute, and waived such adverse claim.

In both of the supposed instances the necessary consequence would have been to conclusively determine in favor of the applicant, so far as the rights of third persons were concerned, that the land was not unoccupied public land of the United States, but, on the contrary, as to such persons, from the time of the location by the applicant for the patent, was land embraced within such location, and not subject to be acquired by another person. And this result, flowing from the failure of the owner of a subsisting senior location to adverse an application for patent by the owner of an opposing location, or his waiver, if an adverse claim is made, must, as the

greater includes the lesser, also arise from the forfeiture of the claim of the senior locator before an application for patent is made by the conflicting locator, and the consequent impossibility of the senior locator to successfully adverse after the forfeiture is complete."

We confess that we cannot understand the logical step here taken. It reads like an *a fortiori* deduction—because a certain result flows from certain things, it follows even more surely from other things. But, we submit, which is the "greater" and which the "lesser"? Which situation "includes" the other? To our mind the two situations are so dissimilar, so unrelated, that one cannot include the other. In the case of failure to adverse or to prosecute the adverse claim, there are only two parties—the senior and the junior claimant. No "third person" is involved. Consequently, just as in a default judgment, as pointed out by the note writer in 68 L. R. A. 843, or just as in bankruptcy proceedings where a creditor has failed to file his claim within the time provided by law, one man loses and by operation of law, the other party prevails, and there is an end of it—*res judicata*—all the world is concluded by the judgment.

On the other hand, the situation presented in the Lavagnino case includes a new man who was not present and before the Court in the "supposed instances." A qualified locator, complying with the terms of Sec. 2324, has located the land in question when it was not in the exclusive possession and enjoyment of anybody and at a time when, in the words of the statute, it was "open to re-location in the same manner as if no location of the same had ever been made." This new man, pursuant to Sec. 2326, is present in Court and asserts his right to the land.

The only reason why an "indisputable presumption" arose in the supposed instances, that "no conflict claims existed," was because the only living man who had a conflicting right, elected to relinquish that right. This cannot logically justify the conclusion that in a case where the only man who has a conflicting right *is* present and loudly asserting it, the same indisputable presumption should or could arise. *Cessante causa cessat effectus.*

As we have before pointed out, no forfeiture for failure to do annual work becomes complete until a re-location after the time has expired; co-existing with the re-locator's right is the concurrent right of the original locator to save the claim by resumption of work at any moment prior to its re-location. Thus, there is a complete continuity of valid subsisting ownership without an instant's intermission. Therefore, even if we assume (as seems to have been done) an inchoate or "eventual" right in the junior claimant under the Uhlig locations, such right never had any chance to attach for there was no *hiatus* in the title in which it could take effect. Indeed the birth of the new right of the re-locator is in law the cause of the death of the old right of the original locator.

Only one plausible theory suggests itself to account for the conclusion reached by the writer of the opinion in Lavagnino *v.* Uhlig. The word forfeiture is sometimes appropriately applied in certain legal relations where one man forfeits to another. If a senior locator could, with the same propriety, be said to forfeit the ground in conflict *to the junior locator* by failure to adverse, we can see that it might with accuracy be said that even more clearly should he be held to have done so by forfeiting his rights before the junior applies for patent, thus terminating his right to file an adverse claim. This view, while furnishing a possible explanation for the language employed in the Court's opinion, lends no aid to the solution of the difficulty, for a forfeiture under Sec. 2321 does not purport to work a transfer of interest to any other person, but simply to extinguish the original claim. In this respect it is like an abandonment; it merely restores to the public domain that which had been segregated therefrom.

A careful and painstaking study of the unusual doctrine of the Lavagnino case inevitably leads to the conclusion that its logic cannot be reconciled with many doctrines long since supposed to be settled; its admitted result (p. 456) is to qualify Sections 2319 and 2324 R. S., whereas a natural construction of the law under the facts presented would have led to harmony of all these sections. Its effect seems to us likely to work the very evil which the same Court aimed to avoid in Belk *vs.* Meagher, "to encourage unseemly contests about the possession of the public mineral-bearing lands, which would almost necessarily be followed by breaches of the peace."

As a matter of fact the immediate effect of the decision in Lavagnino *vs.* Uhlig in at least one rich placer camp was to cause a multitude of 160-acre placer claims to be located, practically covering or blanketing all the locations of probable value in the country. For a time it looked as if the court was going to be swamped with an avalanche of litigation predicated upon the Lavagnino decision. But the judge of that country wisely discouraged that tendency by declaring in a decision which he rendered in granting a new trial, what he believed to be the scope of the Lavagnino decision and the extent to which it was to be regarded as authority. He said:

"The doctrine in that case is so at variance with the doctrine of Belk *vs.* Meagher, 104 U. S. 279, and the long line of cases which follow Belk *vs.* Meagher, and in the opinion of this Court is likely to work great injury to rights hitherto regarded as vested, if taken as overturning the law of Belk *vs.* Meagher in respect to the effect of forfeitures upon the rights of other persons attempting to fasten locations upon the ground which had been covered by the forfeited claim, I therefore believe it to be a case binding only in adverse proceedings, where a patent has been applied for, and within its own limited circle of exceptional facts and circumstances."

(Judge Alfred S. Moore of the second division of Alaska, in Montague *vs.* Labay, 2 Alaska Rep. 575).

If these views correctly state the law, it would seem that the old doctrine of Belk *vs.* Meagher, 104 U. S. 279, may still be regarded as sound and that the abandonment or forfeiture of a location will not cause it to inure to the benefit of a junior overlapping claimant, unless he, pursuant to R. S. Sec. 2324, shall have re-located the ground after the forfeiture or abandonment, and before the accrual of intervening rights.

It may be proper to note that Mr. Justice Brewer "concurs in the result" (198 U. S. at p. 457). This can only mean that he did not concur in the reason. It may not be improper to also note that on the day of the decision of Lavagnino *vs.* Uhlig, May 29, 1905, twenty-four other decisions were handed down, in eighteen of which were opinions by the various members of the Court. The conjecture may be hazarded that this mass of work which had to be disposed of before the adjournment of the Court for the summer may have made it impossible for the Lavagnino opinion to be scrutinized very closely by all of the justices who concurred. In any event, taking everything into consideration, it seems safe to assume, when the same Court next has occasion to rule upon a like situation, that while the judgment in the Lavagnino case may be approved upon the reasons, or some of them, adopted by the Utah Court, the reasons stated in the official report will be disapproved and the public assured that the doctrine of Belk *vs.* Meagher is still unshaken.

A Tin Deposit Near Spokane.

Written for the MINING AND SCIENTIFIC PRESS
By A. R. WHITMAN.

Within the last two months there have been made public the facts of a new mineral discovery near Spokane, Washington. The quite natural scepticism of the public as to the conservatism of the press announcement, has prevented the awakening of a general interest in the finding of a deposit of mineral so rare and heretofore so unsuccessfully mined in this country. Nevertheless a seemingly rich deposit of tin ore has been uncovered almost in the suburbs of this busy mining centre.

The deposit is situated on the south slope of Silver hill, which lies 12 miles south of Spokane, on the Palouse line of the Spokane & Inland railway. This hill is a low spur projecting over the edge of Moran Prairie from an irregular range of moderately high hills, having a northwesterly trend. This range was originally formed of sedimentary rocks, but it has been profoundly altered by a granite eruption that affected this whole region. At the base of the hills lies the great Columbian basalt sheet, which flooded the country after the hills had been eroded. At some time subsequent to the granite eruption another igneous invasion occurred in which more decidedly acid lavas played the leading part. Of these the most conspicuous and most important at the locality in question was a tin-bearing felsite.

After the felsite intrusion, the locality was subjected to stresses and strains from all directions, which created fissures of various sizes, the principal ones ranging themselves into a system having a strike a little south of west and dipping at all angles. These crevices immediately became the vents for the heated waters and steam following the eruption; and widely scattered veins of quartz now bear evidence of the activity of these thermal springs.

At Silver Hill the sedimentary rocks are metamorphosed into quartzite, andalusite slate, mica schist, and, in some places, to a fine-grained, highly feldspathic granite. They were distorted and shattered by the granite intrusion till it is difficult to guess at their original form and position. The granite did not confine itself to fissures nor to the bedding planes of the sedimentaries, but invaded them in all directions, breaking them into blocks and shreds, and mixing these promiscuously. Thus the granite cannot be said to lie here nor there in the hill, but comes to the surface at irregular places. The felsite, however, seems to conform to a system of fissures, resulting in the arrangement of the outcrops into four zones, striking north-northwest.

Where the south slope of the hill begins to turn westward, the most pronounced and richest zone makes its appearance. This has been explored by an open-cut, called the West cut, which penetrates the hill for 30 ft., exposing a breast 15 ft. high. In this breast the orebody is plainly disclosed. About 200 ft. east of this there is a parallel zone, which appears to be barren of tin. Three hundred feet east of this is a third outcrop, which, though carrying only a small amount of tin, seems to be part of an intrusion that has given rise to numerous large pieces of float, which are fully as rich in tin as the ore of the West cut. Two hundred feet farther east from this point is a second open-cut called the East cut. No felsite is exposed here, but about 180 ft. east of it there is a single outcrop of barren felsite.

At the West cut a dike-like body of granite has broken through the sedimentaries, which here strike 10° south of west, and dip north at an angle of about 45°. The granite mass is 18 ft. wide, and its east wall strikes northwest and dips westward at an angle of about 60°. The felsite appears to have ascended along this east wall, forcing its way along the bedding planes of the sedimentaries, and in some places thrusting them back bodily, causing them to be laminated at right angles to their strike. This has given the body thus far exposed such a form that a cross-section shows three distinct bodies separated by strata of metamorphosed sandstone and abutting against the granite. The upper body constitutes the outcrop. It is much altered and appears to carry but very little tin. The middle lobe has a semi-lenticular cross-section, the centre of the lens, 5 ft. thick, in contact with the granite, and the extremity extending out 20 ft. into the sandstone. The three edges of this body are rounded in such a way as to suggest extreme viscosity in the original fluid; and the metamorphism of the sandstone to mica schist for about an inch back from the contact suggests a high temperature and slow rate of cooling the mass. This body probably averages 6% tin. The lower lobe is about 25 ft. long and of undetermined breadth. The upper portion of it resembles the middle lobe, but the under side of the lens, about 10 ft. from the granite, turns down parallel with the granite, giving the lower part of the body the appearance of a dike. Here it is that the sedimentaries have been thrust back and laminated. The tin contents of this body probably amounts to about 7 per cent.

The felsite consists mainly of a much altered and kaolinized feldspar, which has the appearance, though not the true composition, of albite. The quartz is inconspicuous and often difficult to distinguish from the feldspar. Muscovite and biotite micas are abundant near the periphery of the intrusions, and black tourmaline is associated with them. The inner portions of the bodies are characterized by the presence of lithia mica, and small pink blotches due to clusters of the capillary prisms of rubellite. In some places the cassiterite is seen near the periphery, but it is mostly confined to the interior of the body. It is black, and contains a small amount of iron, but is otherwise unusually pure, yielding on analysis 73% tin. It occurs in irregular, but decidedly angular masses, ranging in size from rectangular specks an eighth of an inch in diameter, to masses, in one or two cases, six inches in cross-section; the average mass would probably measure one inch by one and one-half by one-half inch. In the other felsite zones rubellite is common, but the black tourmaline seems to be most plentiful where there is little or no tin. One of the most interesting and significant phases of this occurrence of ore consists in the association of other metals with the tin deposit. The chief of these metals are lead, silver, copper, and tungsten.

Nearly horizontal veins of quartz sever the orebodies in the West cut, and others follow their east profile. These are practically barren save where they come in contact with the felsite. On this contact occur both wolframite and scheelite in such a manner as to suggest a metasomatic replacement of the feldspar by the scheelite, and the subsequent alteration of this mineral to wolframite, through the replacement of its calcium by iron and manganese, leached from the constituents of the eruptives. A single specimen taken from the contact will illustrate this. It shows a band of wolframite spangled with muscovite mica, cemented on one side to the felsite and on the other to greenish yellow scheelite. The periphery of the intrusions, as has already been stated, carries muscovite and biotite micas. In this specimen muscovite plates are conspicuous in the felsite; and the presence of the same mica in the wolframite in about the same proportion strongly suggests that the feldspar that originally surrounded the plates has been replaced.

A still more interesting occurrence of tungsten, and incidentally, a proof of the secondary character of the

wolframite, exists in the East cut. Here the granite is seen in contact with the sedimentaries, which it has bulged upward and broken through. They are metamorphosed, in part, to a fine-grained, highly feldspathic granite, and both rocks are full of small fractures and veinlet-, dipping in all directions. These are iron-stained, but otherwise present no unusual appearance. However, within six feet of the surface where the metamorphic granite is soft and decomposed, and deeper down where the water has leached out the soluble materials along the crevices, what appear to be nodules of quartz are seen within the granite close to the veinlets. Many of them are enveloped in a crust of black mineral. Examination shows that some of them are quartz, while those encrusted with the black mineral are scheelite, the black mineral being wolframite. These nodules vary in size from that of a pea to oval-shaped masses three inches in diameter. Some of them include small bits of the unaltered granite, while all are more or less securely cemented to the feldspar in the surrounding rock. These facts seem to indicate that the nodules are concretionary replacement growths, originating from the permeation of the granite by the tungsten-bearing silicious waters that filled the crevices in the granite with quartz. The formation of the wolframite must clearly have been a secondary process, due to the circulation of solutions carrying iron and manganese.

The occurrence of argentiferous galena at a couple of points on the hill is also interesting. One of these is a vertical fault-fissure about 50 ft. below the East cut. This is filled with an 8-in. quartz vein, which carries the galena. The other point is about 300 ft. northwest of the West cut, and as it is similar to the other, and a much better illustration, it is more deserving of a detailed study. This is a quartz vein lying within a fault, conformable at this point with the sedimentary strata within which it lies. About 50 ft. in the direction of the dip of the vein is a wide granite intrusion, that deflects its course downward along the nearer wall of the vein, which is 18 in. thick where seen in the stripping on the hillside and lies on a gouge-covered stratum of silicified shale. This vein has a remarkably symmetrical structure. On the foot-wall, in contact with the shale, occurs the galena; next comes a mixture of black tourmaline, feldspar, and quartz, the tourmaline having its characteristic crystallization and the quartz having the form of small rice-like globules within the feldspar. Gradually, as the barren centre of the vein is approached, first the tourmaline disappears and then the feldspar. Then, as the hanging wall is approached, the order is exactly reversed.

On the foot-wall, where oxidation has proceeded more slowly, the galena is found in its incipient stages of alteration. Several specimens were secured that showed a small mass of galena surrounded by a dark grayish brown mineral, which analysis proved to contain lead sulphate and carbonate; and this was coated with a greenish yellow crust of cerussite. On the hanging wall, where oxidation is complete, the lead exists only in the form of a yellowish powder of cerussite in cavities in the quartz.

The origin of this vein is not a subject for discussion here, though it might be suggested in passing that its form and contents seem to indicate that the mineral deposition was begun by steam or highly heated waters, and that as the aqueous eruption subsided the cooling water first lost its power to carry tourmaline, then feldspar, and finally filled up the vent with pure silica.

This brief description of the conditions at Silver Hill does not purport to be in any way exhaustive or final, but is a mere collection of notes from a hurried reconnaissance of the field.

Letters of a Self-Made Miner to His New Foreman.—IV.

Written for the MINING AND SCIENTIFIC PRESS
By MATT. W. ALDERSON.

My dear Tom:

You have worked in mines where the practice was to take all the ore out of the shoot opened, until it pinched on the sides and bottom and then to leave it as worked out. We don't work the Imalulu that way. I never expect to live long enough to see more than a fair start at working it out, and I wish you to work the property every day as if you expected it would be yours ten years ahead and you would like just as much good ore in sight as possible and the mine in fine shape in every way at that time.

Most mine owners pocket the profits that come easily and then turn a cold shoulder on the mine that has been good to them. Fifty per cent of the profits of operating this mine go back into development work, so you will always have men opening up new territory.

You will work the lean parts of the mine first, keeping the large size orebodies in reserve as much as possible. Each time you leave a stope and resume work there you entail loss of time and create needless expense. The ground gets dirty and discolored, it takes a man a shift or two to get the lay of the ground, position of the ore, etc., and to handle himself to best advantage. Except where, because of extent and value of orebodies, it is decided to keep them in reserve, you will work all places to a finish when once you begin.

Before opening a new stope, consider the most economical way of doing so, having from the start the end in view, the storing of the ore for the men to stand on, and the removal of the ore and waste so as to avoid mixing them. Where a stope is started on a narrow seam, open out well to begin with. It is always expensive to follow small seams without first opening out the ground. Have stages put in promptly to enable your men to work to advantage and check the falling of ore to the level as soon as expedient to avoid the needless expense of shoveling.

When hoisting it is very important that the skip be kept running without avoidable intermissions. Delays which cause a stop in tramming in the levels, filling cars, etc., are expensive. Without system and regularity here you may easily paralyze the efforts of everyone above ground and below.

The foreman of the mill is on the same level as yourself. He has complete charge of the mill. Neither of you has any authority over the other, but you will work in harmony with each other. You furnish the raw material and he works it up. You will consult his wishes in supplying ore from the mine. Ordinarily you will supply him with mine run (that, with us, is any ore running under $10 a ton), but you will be prepared to furnish him on short notice such ore of better grade as may be necessary to bring the month's output up to the point we wish.

You will break and send to the mill, ore assaying as low as $2 a ton, not that there is a profit in the milling of this grade, but driving in it you may open into something better. Ore assaying $10 and over you will keep in reserve in the mine except when called upon to do otherwise.

You will place a number upon each new chute in accordance with the number scheme of the mine. (See a number scheme for mines, MINING AND SCIENTIFIC PRESS, Oct. 24, 1903. That number scheme again, MINING AND SCIENTIFIC PRESS, Dec. 12, 1903.) You will see that the

stope maps are brought up to date at the end of each month.

You will see that any part of the mine, where timbering is necessary, is well timbered. In no case will you allow sprags to be used for men to stand on and work. See that stulls are put in, in every instance.

You will allow no accumulations of rubbish or waste in any part of the mine to interfere with free access.

You will train your car men to keep their cars well oiled, their tracks properly ballasted, thoroughly drained and free from any spilled ore or waste.

There are two safety exits from the mine, one on either side of the working shaft. You will see that these are kept in perfect order and that connections by strong ladders are made with lower levels as they are extended. You will have your men make their exit from the mine occasionally by these routes that they may be perfectly familiar with them.

You will be expected to know that each man does his work. This does not mean that you make yourself needlessly officious and be afraid to trust your men out of sight. I knew a foreman who thought he must tell each of his men how to point their holes. I generally tell a man what I wish done and leave him free to go at it in his own way. One man will bring the roof down with an upper. Another would put in a back hole; one man will go out on a bench and put in a down hole; another would put in a lifter and tosser. Why should we care? Results are what we want and you should be able to judge your men by results. In this connection it will be well for you to carry a small memorandum book on which to enter when and where each man commences work. At various times you may enter memorandum of how he is progressing. At the end of each month you will post from this into a book, which you will keep for this purpose, the number of feet driven by each man. You may think this hard to carry into effect, and there will be places of which it will not be easy to keep a perfect record; but commencing with drives, raises, etc., you will find it easy to expand to cover more work than you might think. By so doing you have something definite, you are not judging a man by some one day's work, when he didn't feel his best and did poorly, or felt extra well and did splendidly. In time you will appreciate the fact that what is true of every other line of work is true of mining; accurate knowledge of what is done by your employees beats guesswork.

From the present appearance of the mine it will not be long before you have quite a force under you; so it is important that you start with a system that can be readily expanded as required. Shift-bosses and other subordinates will be necessary, as it will be impossible for you to dictate the details to each individual worker. When this time comes you will give your orders to the bosses only, holding them responsible for any shortcomings in the men under them.

You will file an invoice at the end of each month of such supplies as you have on hand, accompanying it with requisition for what is needed. You will keep a good reserve always on hand, and on receipt of new stock you will move the old forward or so place it that you will be sure to take it first when issuing to the men.

There are mines where the employees are allowed to help themselves to such supplies as they think they need. I knew a man who quit work at such a mine one spring with several hundred pounds of powder and other supplies which he had accumulated during the winter. There must be no laxness by which such a thing will be possible under your administration. I expect you to so keep your records that you will know at the end of each week the exact number of candles and sticks of dynamite used by every man on your force.

You will keep yourself so familiar with the mine that you will be able to put on extra men at any time where they can do work to advantage.

You will see that every man has an abundant supply of tools. No man can do good work with a dull tool and you will train your men to send their drills to the shop before they are unnecessarily dull.

You will notice the manner of your men in handling explosives. If any one is careless and neglects to adopt suggestions you may make to him, let him out. You have precious lives in your charge and you will run no avoidable risk.

Finally: Whatever you do, do as well as you know how. Allow nothing to be slighted. Close no level nor allow same to be blocked, but timber and protect every one, so work may be resumed at the face at any time.

Sincerely yours,

TIMOTHY STRONG.

MANGANESE IN INDIA.—Just at present there is a veritable boom on in the manganese ore industry. Many discoveries are being made and the ore seems to be pretty well distributed throughout western and southern India. Some rich deposits have been discovered six miles outside the Mysore frontier in the Bellary district, assaying 51% manganese. All the ore from Mysore and Goa is shipped from the port of Mormugoa, which possesses facilities for loading direct from the wharves. During the calendar year 1906, there were 343,346 tons of manganese ore shipped from the port of Bombay, as compared with 213,860 for the previous year. It is expected that the present year will see an enormous increase over these figures. According to one of the largest shippers in Bombay, manganese ore mined in India varies from 40 to 53% metallic manganese, silica 3 to 12%, and phosphorus from 0.2 down to 0.03%. The largest exporters from India sell their ore as 50% metallic manganese, and sometimes as low as 45%. The industry is at present suffering from lack of proper transportation facilities. The mines are all situated off the lines of railways, and the ore is freighted in bullock carts to the nearest station. Owing to the general prosperity of the country, there has been an enormous shortage of freight cars on all lines and all industries, including that of manganese ore mining, have suffered thereby. There are thousands of tons of this ore piled up at various railroad points for which no cars can be obtained.

IT is surprising that the United States, having extensive deposits of arsenical ores and being the leading consumer in the world, should be dependent for its supplies of arsenic and arsenical compounds largely upon England, Germany, Spain, and Canada. The United States utilizes over half of the world's production of metallic arsenic, white arsenic (arsenious acid), and arsenic sulphides (orpiment and realgar). Another anomaly is the waste by burial in this country every year of several hundred tons of arsenic sulphide which is obtained in purifying sulphuric acid at chemical manufacturing works. This subject offers an opportunity for profitable research to those whose inventive minds may evolve an economical method of treating this arsenious by-product so that it may become of industrial value. In addition to the arsenic recovered from arsenopyrite mined in Washington and from the ores which occur in Virginia, attempts are being made to recover the arsenic which is going to waste in the smelter fumes at Anaconda, Montana.

A Comparison of Coal and Oil Muffle Furnaces.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE J. YOUNG.

The two furnaces (Denver Fire Clay Co.'s soft-coal furnaces) compared were identical in all dimensions with the exception of the combustion-chambers, the combustion-chamber of the oil furnace being altered to admit of better flame distribution than could be obtained by using the coal combustion-chambers. The two drawings (longitudinal and transverse sections) give all the important diversions. The dotted lines give the general shape of the coal combustion-chambers.

The stoking of the coal furnace was carried out in the

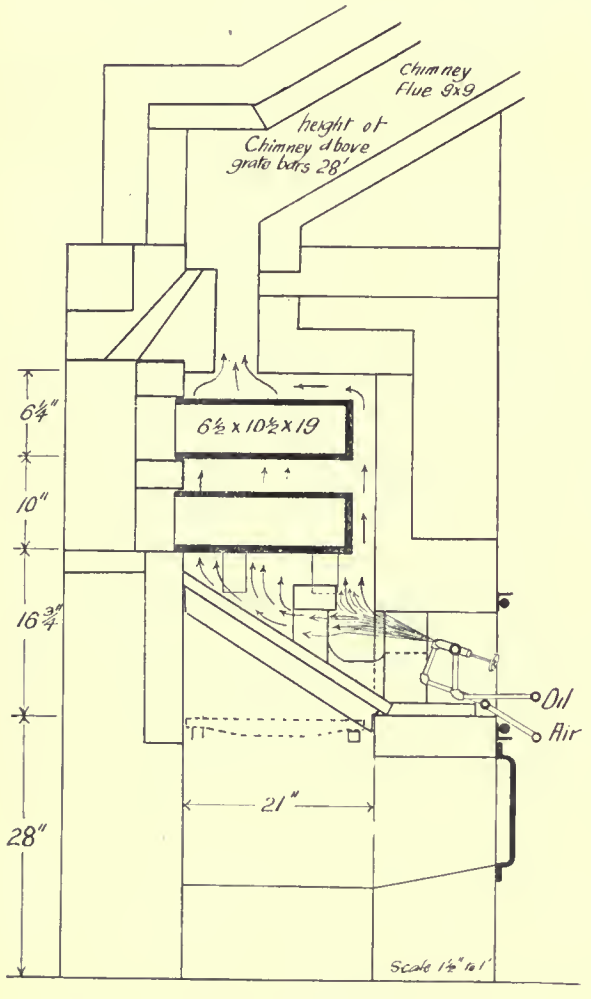


Fig. 1. Longitudinal Section.

following manner (see Fig. 3): The first bed of coal was allowed to burn down to a depth of 2½ to 3 in.; instead of then firing with an even bed, all of the coal was deposited to a depth of about a foot, directly in front of the stoking-door; as the bed of coals in front burned down, enough of the coal from this heap was spread over the front bed to even it and fill any air-holes and fresh coal was heaped on the back bed, the ash-pit door was left open about 3½ in., with the damper wide open. The effect of this method of stoking was to give a hot fire concentrated about both muffles and to give moderate flue-temperatures and a comparatively short flame. The other important result was a decided saving in fuel. The temperatures of the muffles and flue were taken and plotted in Fig. 4.

The oil flame was regulated by both air and oil until the maximum intensity of combustion was obtained. This was determined by direct observation on the flame through a blue glass at the air-holes surrounding the burners. The burners were of the ordinary spray type, with the following dimensions:

Diameter.	Inch.
Needle opening of burner	0.04
Oil opening of burner	⅛
Air opening of burner	⅛
Oil-pipe	¼
Air-pipe	¼

Pressure of oil: 24 to 25 lb., closely regulated by reducing valves.
Pressure of air: 24 to 25 lb., same regulation.

The temperatures of both muffles and flue were taken at the points corresponding to the coal furnace, namely,

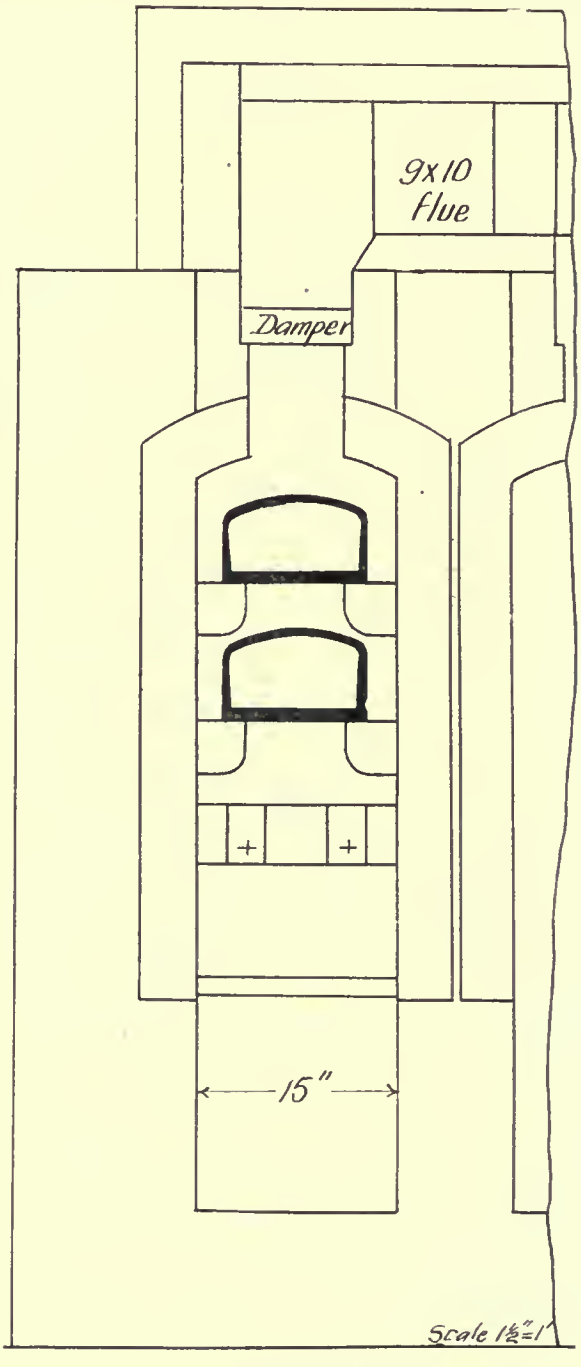


Fig. 2. Transverse Section.

at the centre of each muffle and in the flue through the damper-opening. Observation through the damper-opening enabled the flame to be regulated. Little or no smoke came from the chimney and no carbonization on flues was noticed.

Crude oil of 24° B. was used and the consumptiou of oil was determined by weighing. The coal used in the coal furnace was Utah coal of medium grade and was also weighed. The air was measured at the compressor and the power required was determined by watt-meter readings. Consumption of muffles and grate bars was

determined by the laboratory reports extending over a period of one year.

The consumption of coal averaged 34 lb. per hour. With a better grade of coal and more careful firing a coal consumption of as low as 25 lb. per hour has been obtained with this furnace.

The consumption of oil during the observed period was

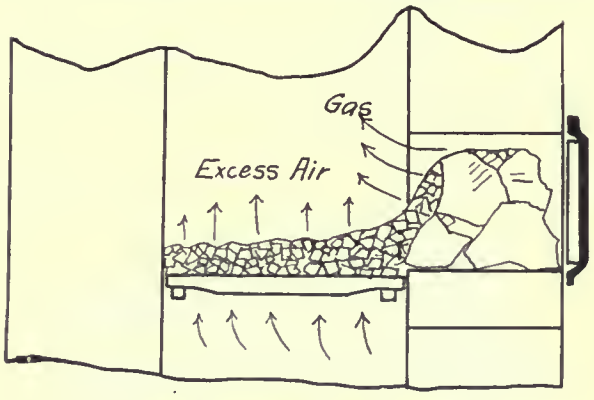


Fig. 3. Stoking of Coal Furnace.

at the rate of 2.75 gal. per hour. Consumption of air was 1.42 cu. ft. for both burners. Power required for air per hour, 540 watts.

The temperature curves for the upper and lower muffles of the coal furnace indicate a more even heating of both muffles than in the case of the oil furnace, although with the latter a higher temperature was obtainable. The temperature in the combustion-chamber of the oil furnace (close to the burners) ranged between 1,400 and 1,600° C. The even heating of both upper and lower muffles in both furnaces was quite noticeable.

The comparative costs are tabulated as follows:

Details.	Cost per hour. Coal. Cents.	Oil. Cents.
Coal, 34 lb. @ ½c. lb.	17	——
Oil, 2.75 gal. @ 6c. gal.	—	16.5
Power for compressed air @ 4c. kw. hr.	—	2.2
Muffles	4	4.0
Grate bars @ 5c. lb. C. I.	3	——
Total	24	22.7

The main advantages of the oil furnace over the coal furnace, apart from the slight one of operating cost, are its cleanness, ease of regulation, the high temperature

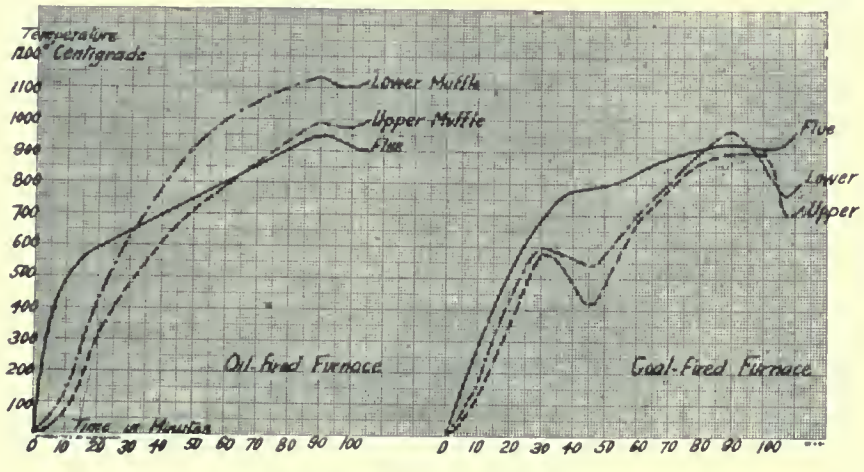


Fig. 4. Table of Temperatures.

quickly reached and easily maintained, and the moderate amount of attention required. The principal objection to be noted is the noise of the burners.

The temperature curves show the difference between the combustion of the coal and oil. With the coal furnace combustion takes place throughout the combustion-chamber, with the oil the combustion takes place principally in the lower part of the chamber. This accounts for the small difference of temperature (15° C.) between the upper and lower muffles in the coal-fired furnace and the greater difference (140° C.) in the case of the oil furnace. The relatively lower flue temperature of the oil furnace is due to the same cause.

DURING the last five years there has been a decided advance in the manufacture of various forms of appa-

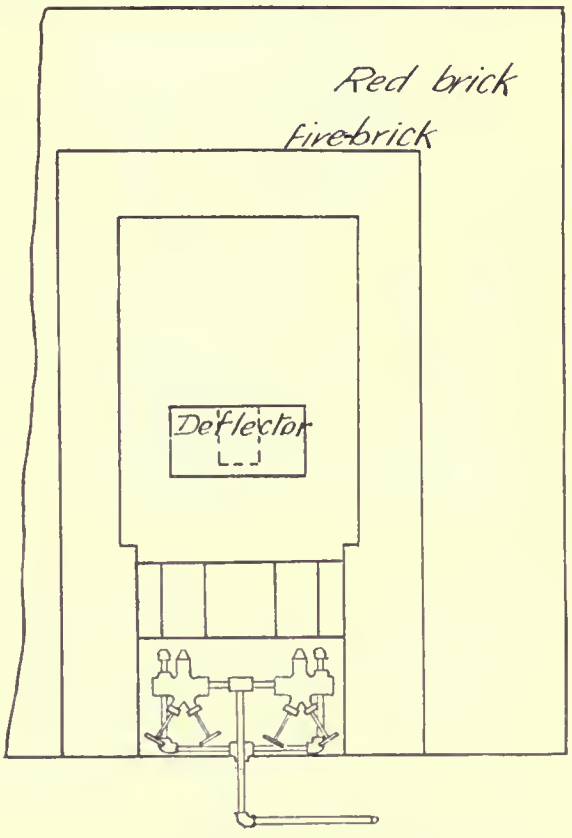


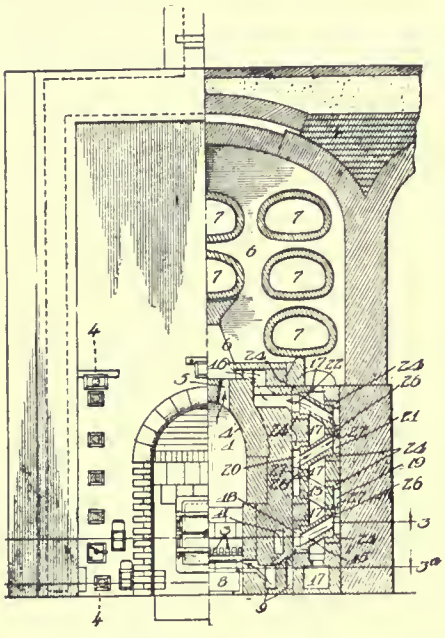
Fig. 5. Plan at Burner Level.

ratus for lighting purposes. These investigations and inventions have led to the practical introduction of certain metals and metallic oxides into the arts which before this time had little or no commercial value. With the demand for these metals and metallic oxides there at once arose the question of their sources of supply, which has resulted in the mining of a number of minerals that were formerly supposed to be extremely rare in their occurrence, but which have now been found in considerable quantity. Experiments are being carried on with still other metals in regard to their usefulness for the manufacture of various incandescent and electric lamps. The metals and the metallic oxides that are now being used and experimented with are tantalum, cadmium, zirconia, thoria, yttria, and cerium, lanthanum, and didymium oxides. With the exception of cadmium, all these materials are being used commercially in the manufacture of different lamps and are obtained from the following minerals: Monazite, zircon, gadolinite, columbite, and tantalite. The use of cadmium for lighting purposes is still in the experimental stage. Cadmium lamps have been made, but are still principally of scientific interest.

MINING AND METALLURGICAL PATENTS.

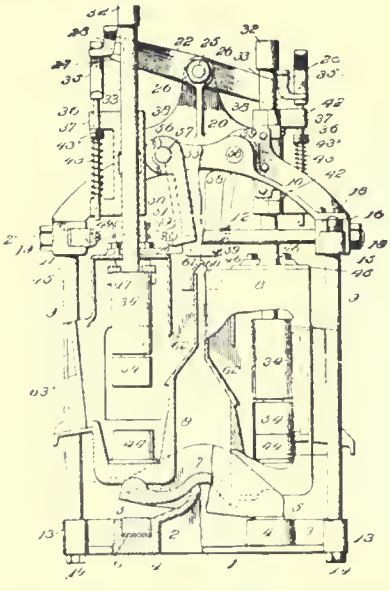
Specially reported for the MINING AND SCIENTIFIC PRESS.

RECUPERATIVE MUFFLE-FURNACE.—No. 852,506; Lazruby C. Hamlink, St. Louis, Mo., assignor to Gas Bench Construction Company, St. Louis, Mo., a Corporation of Missouri.



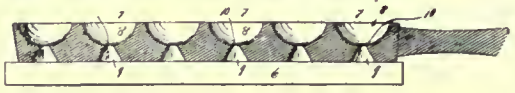
In a recuperative furnace, a downwardly leading outlet flue for the waste gases, and a plurality of inclined recuperator flues extending in zigzag arrangement up the outlet flue and discharging into the combustion chamber, said recuperative flues being composed of a succession of rows of separate hollow tile, the upper ends of each row of which are arranged to discharge into the lower ends of the next superjacent row, and means for admitting secondary air into the lower row of tile, to be heated by the waste gases of the surrounding outlet flue and discharged into the combustion chamber.

STAMP-MILL MACHINERY.—No. 852,756; James C. Anderson, Highland Park, Illinois.



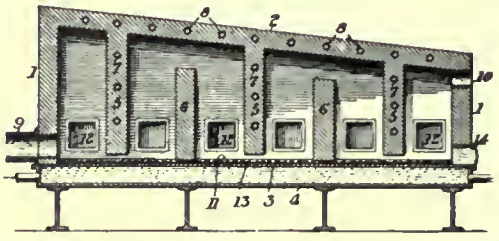
In a stamp mill, a pair of vertically movable stamps, a pair of vertically movable mortars, each located below and in alinement with the respective stamps; and a power transmitting rocker or lever mounted vibratively upon the base of the machine and supporting at each end thereof one of the vertically movable mortars, whereby the momentum shock produced by the descent of each stamp alternately, will through the medium of the vibrative rocker cause the material in the opposite mortar to be crushed between said mortar and the stamp in alinement therewith.

ASSAYER'S POURING-MOLD.—No. 850,811; John J. Bailey, Victor, Colorado.



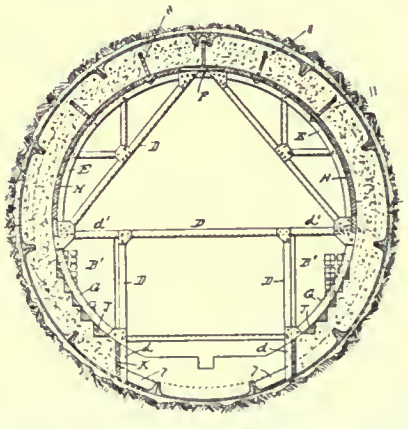
An assayer's pouring mold provided with a receptacle containing two compartments communicating with each other by a relatively small orifice.

METALLURGICAL CONDENSER.—No. 851,520; Woolsey M. Johnson, Iola, Kansas.



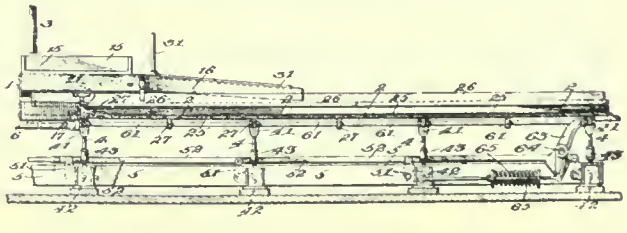
A metallurgical condenser having an interior non-metallic surface, a base plate of metal, and means for cooling said base plate, and means for directing the vapors in a tortuous path through said condenser.

MEANS FOR LINING TUNNELS.—No. 852,891; Ernest W. Moir, London, England, assignor to S. Pearson & Son, Inc., Long Island City, N. Y., a Corporation of New York.



The combination of a tunnel composed of flanged segments with a supporting frame for lagging for use in lining the tunnel and detachable means for hanging the frame from the flanges of the tunnel segments.

ORE-CONCENTRATING TABLE.—No. 850,391; Howard D. McLeod, Great Falls, Montana.



An ore-concentrating device comprising a vibratory table, a stationary rigid frame beneath said vibratory table, a plurality of inflexible bodily-adjustable supports positively secured both to said table and to said frame for resisting both tensile and compressive strains, and means for simultaneously and equally adjusting said supports bodily, whereby the distance between said table and said frame may be altered.

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Editorial.

ANYONE READING the account of the trial at Boise, must have been impressed with two features of the confession made by Orchard; the first is the cheapness of human life as gauged by the payments he claims to have received for the murders he committed, and the second is the utter incapacity of the police in Colorado, Idaho, and California, in that they failed to stop a series of such stupid crimes.

TRAVELERS who pay excessive toll for the use of Pullman cars, and support a large number of sycophantic Africans, will be glad to know that some of their money is being usefully employed in developing the mineral resources of Montana. An Afro-American Mining & Milling Company has been formed by a number of colored gentlemen, who have devoted $500,000 to the purchase and operation of mining properties in three different districts.

DURING THE YEAR 1906 the Robinson mine, the leading gold mine of the world, produced £1,027,240 from the treatment of 362,367 tons, giving a profit of £632,382. Dividends were distributed to the amount of £550,000, this being 20 per cent on the capital of the company. The ore yielded 56s. 8.35d. or $13.60 per ton, and it is estimated that the extraction averaged 93.183 per cent, this being effected by 210 stamps and 3 tube-mills. The ore reserves are estimated at 2,180,700 tons, of an average assay-value of $14.22 per ton.

MANUFACTURERS OF MACHINERY are usually enterprising, for the business to be successful requires a great deal of intelligent energy, so that the multitudinous catalogues and pamphlets issued by them rarely warrant special comment. But we do not hesitate to compliment the Bucyrus Company on the publication of the President's message on the Panama canal, and the incidental advertisement, by means of beautiful photographs, of the Bucyrus Company's contribution to the building of that canal, in the form of dredges and cranes. The pamphlet, or album, does credit to the printer, the engraver, and the originator.

THE DELAY in bringing the Cerro de Pasco mines to a productive stage emphasizes the large amount of time and money required to make a profitable enterprise out of a deposit of copper ore. The same feature is illustrated by the Tanganyika Concessions. Five years ago these Peruvian and African mines were heralded as sources of copper to be made immediately available, but as yet they have made no noteworthy contributions to the copper market. Even Butte, where so many new mines have been opened during the last three years, is

barely able to hold its own, despite the favorable discoveries in the Anaconda properties. It takes a gold mine to make a copper mine—and time.

AMONG THE HUMORS of the numerous strikes that are making San Francisco and the cities on the Bay a playground for industrial blundering, is the claim of the laundry workmen that the students in the University of California are 'unfair' because they do their own washing. A strike of the employees in the laundries has diverted business to the French and Chinese establishments, and has made washing both bad and expensive. A few of the students lately had the energy and thrift to do their own washing and some walking delegate from the unions has discovered this startling fact, with the result that he has injured his cause, as most of them do, by inviting ridicule. The bakers will soon object to home-made pastry and then we shall be deprived of the pie "that mother used to make." Even worse, the market gardeners will refuse to sell vegetables to those who imitate "the gardener Adam and his wife" by growing a little lettuce. If resentment against an ignorant tyranny will not break it, it may be that the ridicule provoked by foolish acts will serve to put an end to an intolerable condition of affairs.

State Geological Surveys.

GEOLOGICAL WORK is appreciated in Illinois. We note that the Legislature of that State has voted $40,000 per annum for the work of its Geological Survey, this being an increase of $15,000 as compared to the last appropriation. The Legislature has also endorsed the plans for making maps and examinations of swamp lands and tracts subject to overflow, with a view to reclamation. We congratulate Mr. H. Foster Bain, the Director of the Geological Survey of Illinois, to whose energy and ability this action of the Legislature is a direct compliment. In Arkansas, a geological survey has been re-established and Mr. A. H. Purdue, professor of geology in the State University, is likely to be put in charge. He is a competent man, from whom good results may be expected. In Tennessee, the Governor urged the Legislature to recognize the geological needs of the State, but unfortunately the squabbles of the Legislature prevented anything useful being done. In Indiana, the appropriation for the State Survey was increased and the salary of Mr. W. S. Blatchley, the State Geologist, was raised. In Colorado, a survey has been organized with the Professor of Geology in the State University in charge and a small appropriation has been voted. In Missouri and Iowa the appropriations were increased. The Constitutional Convention in Oklahoma has provided for a State Geologist. We take pleasure in recording these evidences of an increased interest in geological work, and we trust that these legislative acts indicate a vigorous maintenance of the State Surveys. The United States Geological Survey will not suffer from this; on the contrary, we believe that the local education of the public to the value of geological surveys will emphasize the usefulness of the Federal bureau and the advantage of co-operation between the geologists at Washington and those directing State work. One of the most important steps taken by the last Director, Mr. Charles D. Walcott, was to call the State Geologists together with a view to harmonious and co-operative investigation, and this far-sighted policy is likely to be fully furthered by his successor, Mr. George Otis Smith. On the whole, the outlook for systematic economic geology is excellent.

On Technical Writing.

A FEW WEEKS AGO we ventured to offer some criticisms on this subject, borrowing our examples of supposed error from the publications of the two leading mining societies. This seemed a step likely to make the discussion interesting and it was calculated to emphasize the importance of correct usage. To be frank, we had an eye to the humor of the position and hoped for a vigorous retort from the secretaries or editors of those societies. But as yet there is only an ominous silence. However, if the officials refuse to add to the gaiety of the nations, one member has undertaken to defend himself. It will be found in our last issue. Mr. C. S. Herzig is a sportsman; his retort is outspoken, and his defense effective. One point is especially well taken, and that is the explanation of the manner in which technical discussions are reported in England. This has always seemed a curious survival of custom. In the course of a discussion men make tentative suggestions and unimportant comments, such as are likely to seem trivial or even foolish when put into cold print. Thus Mr. Smith remarks that "if he remembers correctly, the specific gravity of quartz is 2.6" and Professor Brown assures the honorable gentleman that his surmise approximately correct; or Thompson refers to the production of a Mexican mine as being 50,000 dollars per day, whereupon Robinson asks whether the gentleman is talking in terms of American or Mexican currency, receiving the reply that the speaker is not sure which it is, but he will ask his informant the next time they lunch together. Something of this sort is allowed to get into the records, although such conversational matter ought to be excised and only information of permanent value preserved. Mr. Herzig's analysis of the use of 'very' is to the point, but it illustrates ours also. The occurrence he mentions is so rare as to warrant the use of 'very,' which would gain strength from an enforced rest. If Mr. Herzig and his friends will reserve 'very' for the rare occasions indicated by him, we shall achieve a restraint of language that will be satisfactory even to the hypercritical. As to the use of the impersonal 'one,' our correspondent hits us below the belt. We demur to the inference. One who is so clear in his views should not veil his identity under a mock-modest pronoun but come forth frankly under the egoistic first person singular. Speaking seriously, if we object to the use of the indefinite pronoun, it is because by much editing of vague writing it has been impressed upon us that it makes for confusion

and indefiniteness of statement. In his last paragraph Mr. Herzig makes a plea to which it is difficult to reply; if criticism is not acceptable, it will fail of its purpose. We had a distinct aim in bringing forward the subject of technical writing, believing that efficiency in one tool of the engineer is as desirable as in another, he ought to use his pen as intelligently as his slide-rule and be as systematic in his arrangement of words as in his design of a reduction plant. We do not despair of accomplishing some good. If our criticisms are just they will be effective; in any event, they will prompt more care in writing.

A Question of Practical Mining.

NEWS FROM MINING CAMPS often includes such a statement as "the Blank Company intends to sink to 1,000 feet depth before cross-cutting," or "the shaft of the So and So Syndicate has now reached a depth of 600 feet, and another hundred feet is to be completed before cross-cutting will begin." Both of these quotations are taken (except the names) verbatim from a daily paper. Statements of this kind are intended to be impressive, as indicating unusual vigor in exploratory work and suggesting tremendous possibilities when the cross-cuts finally reach the lode. To experienced miners the sinking of vertical shafts in new mining districts to cut veins of ore at a depth of several hundred feet will be rated at its full value. This idea of going out into the hanging-wall country of an unprospected lode and spending thousands of dollars on workings that finally intersect the line of the lode at one point, is contrary to the common sense that underlies all practical mining. There is always plenty of talk of the 'practical' as against the 'theoretical'; we venture to say that the most theoretical system of mining, and the one most completely divorced from practice, is this scheme of the promoter, who extends the time of glittering uncertainty and postpones the date of disillusionment by planning operations the main feature of which is that they give the minimum of evidence concerning the worth of the mine. We would like to see this topic discussed. Speaking from the standpoint of practical mining, we venture to say that the first thing a miner should do is to find a vein, then the valuable ore in that vein, then stick to the ore. In trying to ascertain the character of a lode in an undeveloped mine, and especially in a new district, it is best to follow the ore, even with an incline shaft. It is good mining to sink a winze on a new discovery, even in a well established mine, for while it is more costly to sink than to rise, it is best to find out something concerning the shape of the orebody before planning a raise or advancing a new level. When a young mine is being opened up, it is imperative to obtain information in regard to the persistence, size, and pitch of an ore-shoot; this is done best by following the ore, for such a method of working is productive, in the first place, and it is informing, in the second. Even if the miner cannot advance in ore, he will prefer to follow the vein where it is poor, rather than push his way into the outer country, where his work yields neither information nor results until it is consummated by reaching the vein. A real miner hates 'dead work,' and this aversion is well rooted in experience. The answer of the colonel or the broker that is probably responsible for the deep shafts mentioned at the outset of this discussion, will be that it is a mistake to waste money on 'gopher holes' and crooked inclines on the vein, when a vertical shaft sunk in first-rate fashion will afford the means to cut the ore at such a depth as to ensure large reserves. Of all the counting of chickens before they are hatched, there is none so mistaken as the estimation of ore in untried veins and the talk of reserves to be obtained by cutting a lode at one point. We appeal to the experienced mine managers for their opinion. It is an important matter, for we feel assured that much money is being wasted in blundering exploration, and that many mines are being spoilt by the vertical-shaft-deep-cross-cut scheme. It works this way: A company is organized to exploit a promising prospect, and a certain sum of money is raised to make a mine out of a hole in the ground. Instead of following the ore exposed at the outcrop, or cut in a prospector's trench, to determine how far it extends and how much expenditure in equipment it may justify, the management decides to start a shaft that is planned to cut the vein at a depth of several hundred feet. In the meanwhile the ore of the outcrop gives assurance that there is something there, and the pretentious scheme of operations tends to magnify the possibilities. Before the shaft, or the cross-cut from it, can reach the lode, a large amount of stock has been sold, the insiders have made a handsome profit, and most of the working capital has been spent. Should the cross-cut or shaft intersect the vein at a poor spot, as is likely, even in a good lode, the shareholders are needlessly discouraged. Sometimes so much money has been spent in taking this long shot, that no more remains; and the mine passes into other hands or into that of the insiders. Even if all is square and above-board, the shaft and cross-cut may be succeeded by a raise and by intermediate drifts before it is made plain that the vein has changed its dip between surface and 500 feet, or that the ore-shoot has a pitch different from that inferred at the grass-roots. It is because miners know something of the vagaries of ore occurrence that they take short views and prefer to go slowly in their explorations; only simpletons or spoofers plan adits to cross-cut creation at a great depth, or sink shafts to intercept ore-shoots of unknown character. It will be said that it is cheaper to hoist ore through a permanent vertical shaft than through a prospecting incline, and that it is better mining to extract ore through an adit than to raise it through a shaft. Yes, provided you have the ore. Get the evidence of the ore, its shape and its position, then go ahead and plan to extract it cheaply. The best mining is the cheapest mining, the cheapest is that which yields the maximum profit during the period of ownership, and to this we add the proviso that the profit is supposed to come from the economical treatment of the ore, and not from exploiting the simplicity of our fellow citizens.

Personal.

S. F. PARRISH is in central Arizona.

F. LYNWOOD GARRISON is at Los Angeles.

WALTER H. WEED has returned to New York.

J. PARKE CHANNING is expected in San Francisco.

MATT. W. ALDERSON has been lately at Helena, Montana.

GORDON LAND, lately at Oroville, is now at Grants Pass, Oregon.

C. B. WINGATE sails from New York by the *Umbria* on June 8.

ERNEST LIDGEY has an office at 30 Salisbury House, London.

FRANK W. OLDFIELD has arrived at New York from Ecuador.

H. H. CLAUDET, of Claudet & Wynne, has returned to Rossland, B. C., from Mexico.

C. J. GARVIN is general manager for the Green Mountain Mining Co., near Silverton, Colorado.

N. P. WILSON, manager for El Porvenir Mining Co. at Parral, Mexico, has returned there from Denver.

EDWIN C. HOLDEN, of the firm of Hill, Holden & Irvine, is on his way from New York to Sonora, Mexico.

F. G. MCCANN is superintending systematic prospecting work near Rio Balsas, Guerrero, for an Arkansas company.

THOS. B. CROW, formerly of Prairie City, Oregon, is operating in the Argentine district near Montezuma, Colorado.

FRANCIS J. TAYMAN has been called from mining work in Mexico to St. Louis, on account of the illness of his father.

M. S. GRIFFITHS is expected in Mexico City after three months' examination of timber and mining claims in Guerrero.

FRANK ROBBINS, having finished a preliminary exploration of the nitre beds in southern California, has returned to Los Angeles.

NORVAL J. WELSH has resigned as superintendent of the Santa Brigida mine, in Chihuahua, Mexico, and is now at San Antonio, Texas.

FRANCIS A. THOMSON has been appointed professor of mining and metallurgy in the Washington State College, at Pullman, Washington.

H. MCCULLOUGH, formerly electrical engineer for the Toledo Mining & Power Co., of Sheridan, Mont., is now with the Pittsburgh & Montana Mining Co. at Butte.

E. L. WHITE, for a number of years at the head of the Bureau of Mines of Colorado, has opened an office at 222 Jackson Block, Denver, where he will conduct a general mining engineering business.

H. E. T. HAULTAIN, who for the past 18 months has been manager of the production end of the Canada Corundum Co. Ltd., has been appointed general manager with headquarters at Craigmont, Ontario.

HERBERT HAAS, having completed his work at Torreon, in Mexico, is visiting the smelters in Arizona, preparatory to resuming consulting practice in San Francisco. His office will be in the Flood Building.

OTTO E. FALCH, JR., recently chief engineer to the Pacific Coast Branch Otis Elevator Co., has opened offices at 850 and 852 Monadnock Bdg., San Francisco, to engage in consulting, electrical, and mechanical engineering.

L. VOGELSTEIN & Co., New York, give the following figures of German consumption of foreign copper for the months of January to March, 1907:

	Tons.
Imports of copper	26,506
Exports " "	2,113
Consumption	24,393
As against this same period in 1906 of	28,700

Of this amount 7,007 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES—June 6.

Antimony	26.25@29.25c	Quicksilver (flask)	$38@39.50
Copper	25.75@26.75c	Spelter	7.75@ 8.50c
Pig Lead	5.85@ 6.80c	Tin	43.25@44.75c

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
May 31	23⅜	6	6⅜	67⅛
June 1	23⅜	6	6⅜	67⅜
" 2	Sunday.	No market.		
" 3	23¼	6	6⅜	67¼
" 4	23¼	5¾	6 7/16	67¼
" 5	23¼	5¾	6 7/16	67¼
" 6	23¼	5¾	6 7/16	66⅞

ANGLO-AMERICAN SHARES.
Cabled from London.

	May 29. £ s. d.	June 6. £ s. d.
Camp Bird	1 1 9	1 0 6
El Oro	1 3 6	1 5 3
Esperanza	1 8 9	1 13 9
Dolores	1 8 9	1 6 3
Oroville Dredging	0 16 3	0 16 3
Stratton's Independence	0 3 0	0 3 7
Tomboy	1 17 6	1 19 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

COMSTOCK SHARES—SAN FRANCISCO.

	Closing Prices. June 5.		Closing Prices. June 5.
Alpha	06	Kentuck	10
Andes	15	Julia	10
Belcher	28	Mexican	48
Best & Belcher	82	North Gould & Curry	.....
Bullion	20	Occidental	41
Caledonia	17	Ophir	1.75
Challenge Con	18	Overman	10
Chollar	09	Savage	50
Confidence	90	Scorpion	07
Con. Virginia	75	Sierra Nevada	34
Crown Point	20	Silver Hill	53
Exchequer	35	Standard Con	2.50
Gould & Curry	16	Union Con	29
Hale & Norcross	58	Yellow Jacket	80

SOUTHERN NEVADA STOCKS.
San Francisco, June 6.

Atlanta	$ 38	Laguna	75
Belmont	3.40	Little Tonopah	2.50
Columbia Min	40	Manhattan Con	50
Combination Fraction	1.77½	Midway	1.25
Daisy	1.00*	Mizpah Extension	.....
Fairview Eagle	75	Mohawk	15.00
Florence	3.30	Montana Tonopah	2.75
Gold Bar (Bullfrog)	59	Nevada Hills	5.00
Gold Bar (Goldfield)	25	Red Top	.....
Goldfield Con	4.65	Sandstorm	35
Goldfield of Nevada	1.00	Silver Pick	45
Gold Kewanas	56	St. Ives	90
Great Bend	48	Tonopah Extension	1.90
Jim Butler	78	Tonopah of Nevada	14.50
Jumbo	.....	Tramp Con	43
Jumbo Extension	1.25	West End	80

* Bid.

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. June 6.	Name of company.	Closing prices. June 6.
Adventure	2¼	Mohawk	84½
Ahmeek	.....	Mont. C. & C.	2½
Allouez	47	Nevada Con	13
Amalgamated	84½	North Butte	81½
Arcadian	4½	Old Dominion	45
Atlantic	11	Osceola	122
Baltaklala	8⅛	Parrot	19
Bingham Con	15½	Phœnix	.....
Boston Con	.....	Quincy	111½
Butte Coalition	25	Raven	1¼
Calumet & Arizona	154	Rhode Island	4½
Calumet & Hecla	780	Santa Fe	2½
Centennial	26	Shannon	17
Con. Mercur	40	Superior & Pittsburg	14
Copper Range	77	Tamarack	100
Daly-West	16	Trinity	19
Franklin	13	Troy-Man	2
Granby	120	United Copper com	58
Greene-Cananea, ctf	14½	Utah Copper	64
Isle Royal	14¾	Victoria	6⅛
Mass	4⅜	Winona	7
Michigan	12¼	Wolverine	145

(By courtesy of E. F. Hutton & Co., 490 California St.)

General Mining News.

ALASKA.

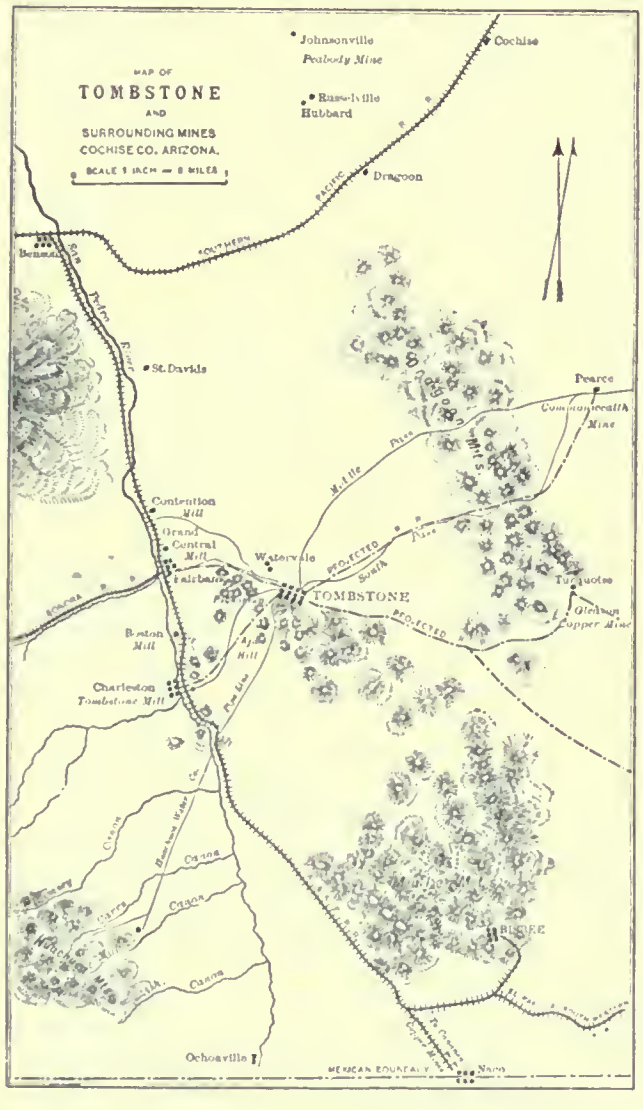
KETCHICAN.

B. D. Brown, president of the Brown-Alaska Co., owning and operating the Mamie mine at Hadley, and president of the Alaska S. & R. Co., owning and operating the smelter at Hadley, has sold his interests in both companies to G. D. Mumford, representing the balance of the stockholders in the two companies. The ore smelted at Hadley last year was valued at nearly $900,000.

ARIZONA.

COCHISE COUNTY.

The strike at Bisbee will no longer be handled by Bisbee Local No. 106, but will henceforth be in charge of the executive committee at Denver. This is in the nature of a retreat from the active field, and is looked upon as a victory for the operators.——The Ainsworth shaft at Paradise, now down 160 ft., will be sunk to a depth of 700 ft. It is thought that copper underlies the zinc-lead veins. The deepest shaft in the Paradise district at present is the Planet, on the San Simon property, which is down 455 ft. The 100-ton concentrator is still at work on the ground, treating the lead-zinc ore.——Two shifts are working on the Leadville.



GILA COUNTY.

While there are about 4,000 men employed at Globe, there is a scarcity of skilled labor, experienced miners and mechanics. The country is flooded with the poorest class of labor, and immigrants from southern Europe.——On No. 3 cross-cut on the fourteenth level of the Old Dominion mine, another body of sulphide ore has been encountered, after driving through about 50 ft. of barren vein-matter. Connection has been made by a drift from A shaft with B shaft and the mine workings on the tenth level, which improves the ventilation. A cross-cut will now be started from B shaft on the tenth level to explore Buffalo hill. Diamond-drill work from the bottom of C shaft, on the ninth level, developed a strong flow of water, and was discontinued. The drifts from A shaft on the ninth and tenth levels should reach C shaft by the end of June. These drifts will drain the wet ground and permit the sinking of C shaft to the twelfth level. The Old Dominion company has contracted for 30,000 tons of sulphide ore to be shipped from a mine in Madera county, California.——The failure to discover ore in the cross-cuts on the 500-ft. level of the Globe Consolidated may result in suspension of work in the cross-cuts. Efforts will be concentrated toward sinking the main shaft, and there will be no further cross-cutting until the 1,100-ft. level is reached. The shaft is about 725 ft. deep, and still in diorite.——The Arizona Commercial company continues to ship 200 tons per day to the Old Dominion, Douglas, and Cananea smelters. Regular development on the Copper Hill and Black Hawk mines is progressing.

PIMA COUNTY.

(Special Correspondence).—Information from Helvetia tells of a big strike of good ore. The Helvetia company has expended a large sum of money on its property and is just beginning to get returns. Its main shaft has reached a depth of more than 1,000 ft., and the strike just made seems to justify the extensive development work. The first level runs 75 ft. to the south in a low-grade sulphide of 4% copper; a cross-cut on this 15 ft. is yet in ore. The north drift of the first level is in 3,000 ft. The first part of it is in low-grade iron ore. Some days previous to the present strike an average sample of 200 ft. went 5% copper. The face of the drift runs 18%. There is a cross-cut about 60 ft. from the face running east which went through carbonate ore for 40 ft. and is now in high-grade sulphide. Near the face of this drift a cross-cut has been extended west for the purpose of sinking a winze for air. This cross-cut is in 12 ft. and the 12 ft. average 15%. The orebody at the first, or 100-ft. level is 60 ft. wide. At the 200-ft. level the cross-cut is in the ore for a distance of 15 ft. The ore is oxide with glance and native copper, and averages 19%. The orebody on this claim crops at surface and it can be traced for 2,000 ft. without a break or fault.

Phœnix, June 3.

YAVAPAI COUNTY.

A good strike has been made in the shaft of the New England-Arizona mine in the Big Bug district, at a depth of 220 ft. At that point sulphide ore was opened, carrying copper and gold. An air-compressor will be purchased and the shaft sunk with machine-drills. The property consists of six claims, lying four miles north of the McCabe-Gladstone mines, and three miles northwest of the Humboldt smelter.——T. H. Oxnam, who has charge of the Humboldt smelter for the Consolidated Arizona Smelting Co., announces that the plant will be increased in size, and a second 400-ton blast-furnace will be built at once. There are two reverberatories in operation, each with a capacity of 400 tons per day. The Humboldt plant gives employment to a large number of men.

CALIFORNIA.

EL DORADO COUNTY.

The shaft is being sunk on the Homestake mine which adjoins the Three Queens.——Men are working in the Eagle Bar mine, but the water is still pretty high.——Some rich ore has been found on the surface near the top of the old shaft at the Taylor mine.——Jay Lawyer, superintendent of the Vivian mine, has ordered the timbers for a 10-stamp mill, the machinery of which was moved from the Darling mine.

NEVADA COUNTY.

The hoist at the Niagara is ready for work. The vein is holding well and some especially good ore has been recently encountered. The company is building a new pipe-line, the intention being to operate the mill, pump, and hoist

with separate power. Water is obtained from the company's dam on Deer creek.——After a delay of 20 days, pumping operations have again been resumed at the Murchie mine. The water rose about 200 ft. in the mine during the period of inactivity and it will take 10 days to pump it out.——The James Brothers, who are developing a claim on the Mitchell ranch, will soon have their four-stamp mill running.——Berkeley men have bonded about six miles of Greenhorn creek, with the intention of dredging for gold, and also about 80 acres carrying the Blue Lead channel.——The Buckeye mine has been consolidated with the Cold Springs gravel mine. The Cold Springs has a bedrock tunnel in 1,500 ft., with 700 ft. of cross-cuts and raises. The equipment includes a 10-stamp mill for crushing cement gravel. The Buckeye has 2,500 ft. of development, 300 ft. being shaft work, and the remainder levels. ——The old Lincoln mine is being put into shape and should be a producer before long. A hoist will be erected and the shaft sunk 200 ft. deeper. H. H. Hicks is directing development.——J. S. Goodwin will build a 10-stamp mill on the Nevada claim at You Bet, which was once famous as a hydraulic camp. About 1,000 ft. of tunnel and drifts have been run. The gravel is hard and will have to be

California.—Showing Position of the Counties.

stamped.——It is thought that the Posey Canyon company has the lost Alta channel. The tunnel is being driven and the heavy ground, that gave so much trouble, has been passed.

PLACER COUNTY.

The last of the equipment for the Crater Hill mine has been received, including pumping and hoisting machinery. This mine was formerly known as the St. Patrick, and is situated between Auburn and Wheatland. It is being reopened by the Harmon people.—— The Taylor Foundry company has secured the contract for the construction of a complete 10-stamp mill for the Southern Cross mine, near Towle. This property has been opened by a tunnel. Electric power will be used to operate the plant.—— Operations at the Ophir are handicapped by lack of water, the supply being inadequate to run the Eclipse and Gold Blossom at the same time.——The new shaft, 300 ft. deep, has been completed at the Bellevue.—— The 200 and 400-ft. levels at the Gold Blossom are being opened. The company's books show that the last 23,000 tons of ore crushed averaged $8.18 per ton.—— Another 50 men were put on at the Hermam last week, and 50 more will be added soon.——At the Sailor Cañon mine, 10 men are employed.—— Promising ore has been found on the 1,100 and 1,200-ft. levels of the Three Stars.——Work will be resumed at the Crœsus mine, where the shaft is down 60 feet.

SAN BERNARDINO COUNTY.

The smelter of the Arizona-Mexican M. & S. Co., at Needles, is receiving lead ores from the Banner and Champion mines at Stockton Hill, in Mohave county, Arizona. Copper ore is coming from the Copper World mine, in this county, all of these properties belonging to the smelting company. The capacity of the smelter will soon be doubled.

SHASTA COUNTY.

(Special Correspondence).—The Shasta Copper Co. has acquired the Arizona group of claims, situated in the Lower Springs mining district, four miles west of Redding. The claims were formerly owned by the Bromide Mines Co. The Shasta company has also secured 30 claims, in the Stillwater district, between Redding and Bully Hill. The Arizona group has been developed to a slight extent, and the new owners will use diamond-drills to prospect the claims.——The ore-bunkers on the road from the Hornet mine to the Keswick smelter have been completed and the shipment of ore will soon commence.——The United States Gold Dredging Co. has ordered a $50,000 Du Bois suction dredge for its claims on the Sacramento.——At the Afterthought, good ore has been encountered in level No. 5. Several cross-cuts have been driven from the shaft to intersect the vein, and the mine is showing up well.—— About 700 men are on the payroll of the Mammoth Copper Co., and the railroad from the mine to the smelter is nearing completion.

Redding, May 30.

At the Summit mine, 14 men are employed. Electric motors and an air-compressor have recently been hauled into the property. The Stauffer Chemical Co. has a bond on the mine. Charles Kunze represents the company, and G. F. Graves is the superintendent.—— The Mammoth smelter, which closed down its furnaces for repairs and to connect the four new blowers, has been blown in again.

SIERRA COUNTY.

The Wisconsin mine, in the Alleghany district, has been visited by the directors of the company since the rich strike that was reported some time ago. The company owns several thousand feet of the North Fork channel which was worked some years ago at Forest, and it has prospected the ground with a tunnel and raises. F. T. Griffith is president of the company, and J. L. Liddell superintendent.

SISKIYOU COUNTY.

A large force of men has been hired at the Mono quartz mine, on Humbug creek. The mill will be run by electric power; new improvements have been made, and the cyanide vats overhauled.——The shaft on the Sheba claim on Patterson creek, in Scott valley, is down 500 ft. The mill will be started at once. The hoisting machinery and mill are operated by electricity supplied from the Fall Creek plant of the Siskiyou Electric Power Co. Noel E. Graves is the superintendent.——Some good ore has been found in the Granite mine, on Humbug creek. The ore is free-milling and shows some free gold.—— The Morrison Carlock company, in Quartz valley, has reduced its force to 20 men, while repairing the main shaft.

TUOLUMNE COUNTY.

A good shoot of ore has been uncovered in the deepest workings of the Big Casino G. M. Co.'s Mack mine, at a vertical depth of about 400 ft.——A vein has been cut in the west end of the Longfellow mine. The 20-stamp mill will be enlarged to 50 stamps. The compressor will be started as soon as the new motor arrives.—— Work will start at once on the 20-stamp mill for the Nonpareil, of which A. P. Dron is superintendent.

COLORADO.

BOULDER COUNTY.

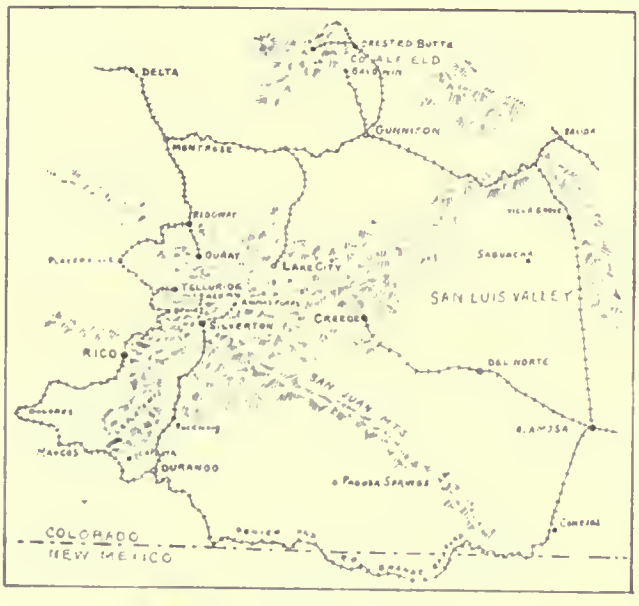
(Special Correspondence).—From reports received from different districts, Boulder county will undoubtedly show up well this coming year. Work is being done and new machinery installed. The big cyanide plant of Langridge &

Davidson in South Boulder cañon, near Crescent, on the line of the Moffat road, is completed, and is proving all that was anticipated. B. A. Langridge is general manager and Frank Lawrance superintendent.——A large amount of development work has been done on the Cash mine at Magnolia during the past four months. The cyanide mill, which will have a capacity of 30 tons per day, will be running in about 30 days. In the mine they have a streak carrying about one ounce gold. The development work, which they have been doing this winter, will give them about one year's work for the mill. The mine is equipped with Leyner compressor and Hardsoeg drills, and the shaft is 300 ft. deep. The mill is being equipped with agitators and amalgamating plates. S. B. Leonard is the manager.

Boulder, June 1.

GILPIN COUNTY.

Eighteen stamp-mills are said to be in operation in Gilpin county, their output during April amounting to $106,000. The bullion output of the county during the month was $146,000 gold. As another evidence of the activity of Gilpin county mines it is stated that there are 25



Map of Southwestern Colorado.

air-compressors at work in various parts of the county. The pneumatic-hammer drills are coming into more general favor, as they can be handled by one man. From the Gold Rock mine in the Russell district sample shipments are going forward, and the Hampton group is making progress in shaft and tunnel operations with a view to developing ore reserves. The draining of the various mines in this district effected by the Newhouse tunnel is already proving advantageous.

SAN JUAN COUNTY.

The Mogul mill is treating about 100 tons per day, which will be increased to 200 tons as soon as the new machinery is put in place.——The Gold King company is developing the shoot of gold ore that was struck at a depth of 800 ft. This ore runs high, and has been driven on for 50 ft.——The Detroit & Colorado company has let a contract for a new aerial tram to connect the upper workings of the property with the railroad. The tramline will be about 900 ft. long. The new compressor has been installed and 15 cars of ore were produced in May.——A good strike of silver-lead ore has been made in the Wallace vein of the Ruby Basin company. An orebody 150 ft. long and three feet wide has been developed during the winter.——An English company has been organized by Arthur Ponsford and George E. Collins, to take over the Polar Star, Mammoth, and 11 other claims on Engineer Mountain.

IDAHO.

IDAHO COUNTY.

Placer mining in the district around Elk City and Newsome, is assuming active proportions, and development work is progressing. Several of the large properties are being worked with success, and in all fifty claims are being actively prospected.——A 50-ton reduction plant is to be erected this summer on the Jim Green group of claims in the Big Creek district of central Idaho. The property is traversed by a gold-bearing vein which carries good ore, and an eight-foot vein containing antimony. W. A. Edwards, manager of the property, has gone to the mine, after a visit to Georgia, where he conferred with the owners.——John Bell has returned to Spokane from Pine Creek, Ida., where he inspected the Nabob mine, where there is a body of 18 in. of shipping ore. The drift was run on a stringer, which at the surface was eight inches wide and 170 ft. from the surface, widened to 16 in. Here a shaft was sunk for 60 ft. and at the foot of the shaft the vein is 18 in. wide. The vein is believed to be the same as the vein of the Crystalite claim, which is in the same group as the Nabob. Another shaft, 60 ft. north, has been sunk 20 ft., showing shipping ore. Besides these showings there are two main veins in the Nabob and Crystalite. The Crystalite is not being worked at the present, but men are at work in the Nabob vein, blocking out ore on the 80-ft. level. The main shaft has a depth of 380 ft., with levels of 80 ft., 300 ft., and the bottom. The level at 80 ft. is a surface tunnel. At the 300-ft. level there are two drifts 280 ft. long. On the lower tunnel the drift is about 450 ft. long. The water is being pumped from this shaft and is now down to 80 ft. below the first level. When the lower level is reached cross-cutting for the two veins will be begun. It is estimated that there is 100,000 tons of concentrating ore on the dump. The management expects to begin tunneling a half mile below the property on Stone creek. The tunnel will give 1,000 ft. of depth on the vein. On the Brooklyn group of claims the only work thus far done is a drift of 60 ft. The drift was run on a vein of ore a foot wide, which assayed 65% lead.

NEZ PERCE COUNTY.

John King, of Winchester, has made a strike of copper ore on Craig Mtn., in the Panhandle country. The rock was found four years ago by King while on a shooting trip. He discovered croppings containing copper and he and his son drove a 400-ft. cross-cut, which recently broke into a 30-ft. vein of ore which assays $47 per ton in copper, gold, and silver. The vein was then traced on the surface for 6,000 ft. After King and his son had located 12 claims they made the news of their find public. A wagon-road and a tramway will be constructed this summer so that shipments may be made.

SHOSHONE COUNTY.

Seattle capitalists, having an option on the control of the stock of the Evolution mine, near Osborn, in the Coeur d'Alene, have decided to install a compressor, erect a bunkhouse, and resume sinking in the old shaft.——A free-gold zone has been cut in the big vein on the Winnie property, near Murray. The width of the lode is not exposed, but it fills the whole breast of the drift. The Winnie, the property of Arastra Smith, has heretofore been considered a tungsten mine, the ore running more than $600 per ton in that mineral.——Four claims, the Anna, Anna No. 2, Last Chance, and Maple, near Osborn, have been bonded by George A. Bevin of Wallace, and D. C. Conrad of Saltese. Galena ore averaging $35 per ton was found in the upper workings several years ago.——Ralph B. Howard, of Spokane, has acquired a quarter interest in a group of five claims known as the Surprise, Center Lode, Maude S., Buckeye, and the Kentucky, on Osborn creek, south of Osborn. The purchase was made from B. E. Stevens of Wallace. The other interest is divided among S. R. Buell, W. M. Buell, W. H. Buell, and A. Pearley, of Osborn.——Machinery, including a compressor-plant and electric motors, has been ordered for the National mine, the bonanza silver-lead property on Snowstorm hill, near Mullan. The total expense will exceed $10,000.——Harry L. Day has made the first payment on the bond of $150,000 for the Custer mine, on Nine Mile creek in the Coeur d'Alene, where development work is pushed in the lower tunnel. The mine produced 121,000 lb lead and 4,500 oz. silver last year.

MONTANA.

CHOUTEAU COUNTY.

A rush is expected this summer to the Bear Paws portion of the Chinook copper district. There is a good showing on the property of the Copper Gulch Mining Company.

GRANITE COUNTY.

Good silver ore has been struck on the northern slope of Red hill, about two miles from Philipsburg. The Hope mine in this district has produced some rich ore of this sort in limestone.——Work has been started on the Mountain Rain group, in the Antelope district, owned by C. W. Davis and associates, of Colorado Springs. A cyanide mill with a capacity of 100 tons per day has been ordered.——Good progress is being made on the Hercules property of the Barnes Copper Co., on Gird creek.——Lawrence Donlan of Tower has sold the San Francisco property to parties connected with the A. S. & R. Co. There are large quantities of low-grade ore developed.——The Trout mine, operated by James Patten, is making regular shipments to the smelters. ——A survey will be made for a pipe-line from Granite to the mill of Bi-Metallic company. This probably means that the mill and mine will start work again.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—A strike has been made in the Nevada Wonder, where a new vein parallel to the main lode has been found. This strike is the second that has been made in the last few weeks.——The shaft of the Monnette Wonder is being sunk to a depth of 158 feet, where the management hopes to strike the vein system of the Nevada Wonder. A large force of men is employed at the mine.—— At the Daisy Wonder the shaft is being sunk to a depth of 100 ft. in order to tap the orebody supposed to be at that point. A small stringer of good ore was encountered at a depth of 50 ft. A 25-h.p. hoist has been installed.——The rush to the new camp of Gold Creek has drawn away many miners from here, with the result that many of the mines are working short-handed.——Water is scarce and living high here, and it is difficult to retain miners.

Wonder, May 25.

HUMBOLDT COUNTY.

(Special Correspondence.)—An 18-in. vein of quartz has been encountered in the shaft of the Fairview mine at a depth of 225 ft. The shaft is now down 250 ft. and will be sunk an additional 100 ft. When this depth is reached a cross-cut will be driven to intersect the vein showing at the surface and the new 18-in. shoot. The mine is owned by the Seven Troughs M. Co.——A shaft and tunnel are opening up the Mazuma Hills mine. The mine is said to contain a rich two-foot vein, but the directors will not allow anyone not connected with the company to enter the mine. ——In the Kindergarten, some ore running well is being extracted and the mine is being worked at depth.——Vernon is reached by way of Lovelocks, on the S. P. railroad, and is only a few hours' ride from Salt Lake City. The town is well supplied with water and has about 300 inhabitants.

Vernon, June 1.

LINCOLN COUNTY.

(Special Correspondence).—Continued prospecting in the vicinity of the Potosi mine shows increasing bodies of zinc ore, and those directly interested in zinc are paying attention to that locality, which embraces a wide area. The ores show as high as 20%, and even 50% zinc. The Potosi continues to ship 35 to 40 tons per day; machinery has been ordered, and the output will be increased. This mine has shipped 9,000 tons, while the ore developed is estimated at 140,000 tons. Shipments thus far average 37% zinc. A prospecting shaft sunk from the tunnel level, 100 ft. deep, shows ore in the bottom.—— The Alpine Plaster company has broken ground 12 miles south of Las Vegas, on the Salt Lake railroad, for its buildings, and is surveying a four-mile industrial railway line to its gypsum quarries.——The Lucky Strike shaft is 105 ft. deep, and drifts are being run from the bottom of the shaft. The car shipped returned 77% lead, and another car will be shipped soon.—— The Vegas Artesian Water Syndicate's first well, three miles northwest of Las Vegas, has flowing water, it being encountered at 30 ft., and at 174 ft. it flowed out of the top of the casing.

Las Vegas, June 1.

(Special Correspondence).—The Golden Crescent company is developing the Opal vein on the Syndicate claim, and in the workings have opened up two feet of rock running $8 per ton.——Two feet of ore has been opened on the Jumbo claim of the Searchlight Gold Extraction Co., and the find is being explored.——Three feet of ore has been opened on the 200-ft. level of the Ajax Bullfrog, and R. H. B. Warburton, the superintendent, is engaged in driving a 150-ft. drift to open up the vein. In the development on the Nevada Crescent, some ore has been discovered that will run $200 per ton.

Crescent, June 1.

NYE COUNTY.

(Special Correspondence). — The annual report of the Tonopah for the year ending February 8, 1907, shows that the production amounted to $473,492, a net earning of $316,971; 16,458 tons of ore, at about $30 per ton, was produced and shipped to the smelters. During the period the company paid three 10% dividends.——During the week ending May 23, the following amount of ore was shipped from Tonopah: From Tonopah M. Co., 4,000 tons; Belmont, 400; Tonopah Ex., 220; Montana, 145; Jim Butler, 41 tons; and Midway, 40 tons.——A rich shoot of ore was recently found on the 400-ft. level of the Tonopah Extension. In places the vein is 42 ft. wide.——A cross-cut driven from the 400 level of the West End Consolidated shaft, shows the lode to be 112 ft. wide. The vein lies between well defined walls.——The work of developing the orebodies at the Jim Butler steadily progresses, and some excellent ore was recently encountered.

Tonopah, May 25.

WHITE PINE COUNTY.

(Special Correspondence).—Owing to the non-arrival of steel and heavy timbers for the plant, the first unit of the Steptoe smelter will not be in operation before the early spring of 1908. Delayed shipments of machinery are slowly coming in, but the congested condition of the railroad supplying this camp is tending to greatly hinder its progress. ——The shaft at the Steptoe Con. is down 40 ft. and has reached a vein of copper four feet wide. A bunk and boarding house has been erected, and the work of developing the vein will be pushed.——A 4 by 8-ft. working shaft is being sunk on the Copper Queen, and some good ore, containing copper carbonate and silver, has been encountered. The main vein has been traced for 4,800 ft., and in places is 60 ft. wide.——Alfred Fletcher, of Leeds, England, and J. W. Walker, of Cherry Creek, have purchased The Chief of the Hills mine, in the Cherry Creek district, from F. M. McDermid for $40,000. The new owners will sink a double-compartment shaft 700 ft. deep, and will immediately install a 40-h.p. hoist. The property contains gold, silver, and lead.——Utah capitalists have acquired the Champion group from George W. Dale, of Los Angeles, for $20,000 and are making arrangements to put a force of men at work to open up the property. Two 100-ft. tunnels and a 70-ft. shaft have opened up a vein which carries a little lead, silver, gold, and copper.——Some excellent ore has been uncovered in the Ely Witch, and the management is preparing to increase the working force.——One of the richest strikes ever made in this district is reported by the management of the Ely Central. Ore running 15% copper was struck in the 440-ft. level, and the vein is of fair size.—— Developments are rapidly progressing at the Ely Consolidated property and immense quantities of ore are being blocked out. A large force of men is employed at the property and large areas of territory are being explored with churn drills.——The new gasoline hoist at the Robinson is in position and the 75-ft. shaft will be sunk. Some good ore has been uncovered.——Superintendent Clark of the Blaine mine, in the Granite district, 35 miles north of here, reports that the tunnel that is being driven to tap the orebody recently opened up by the 260-ft. shaft is in good ore, although it is 150 ft. from the point desired.——A good strike has been made in the Copper Jack claim at Mizpah,

the ore running over $100 in gold and copper. The shaft on the Jumbo has not yet cut the vein, but indications for an orebody are good.——The Independence mine has been bonded by Colorado capitalists for $15,000. The bonders expect to develop the mine during the summer.

Ely, June 1.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence). — The Oversight Mining & Milling Co. has put a pump in the Pin-money shaft and resumed sinking. Two new strikes of pay-ore have been made on the Oversight claim.——At the Winnipeg mine the compressor-plant has been installed, and power-drills will be in operation some time this week.——A body of ore 40 ft. wide has been cross-cut from the head of a raise 40 ft. above the No. 2 adit. The ore is iron sulphide, but no information is obtainable regarding its value, except that it is good enough to ship. The company will increase its working force, cross-cut from the No. 2 adit, and get ready to stope ore for shipment.——Nearly four years ago the Lucile Dreyfus Mining Co. got into difficulties, through forgeries and fraudulent issues of stock by Eugene A. Kressley, its former secretary, who served a term in the penitentiary. The mine, at Danville, was immediately closed. All difficulties have been adjusted, and men are putting the mine in shape to resume operations. The company expects soon to be shipping. The vein is 100 ft. wide, and from 25 to 30 ft. of iron sulphide, carrying gold and copper, has been intersected on the adit-level. A winze is down 100 ft., and a cross-cut from the bottom is about 25 ft. long and all in ore.——The British Columbia Copper Co., owning the Lone Star and Washington claims, contiguous to the international boundary line, about two miles northward from Danville, is getting that property on a paying basis. From 200 to 300 tons of pay-ore have been mined near the surface, east of the old shaft, which was sunk 300 ft. New ore-bins have been constructed, and the company is preparing for steady shipments to its smelter, at Greenwood, B. C.——An adit has been driven 860 ft. on the Advance mine, near Covata, in which a silver-lead vein, seven feet wide, has been encountered, at a depth of about 400 ft. The ore will yield rich concentrate.——A blind vein was encountered in the lower adit of the Gwin mine, about 200 ft. deep and a little over 200 ft. from the portal. It is 10 ft. wide between the walls and is well mineralized throughout. A three-foot streak on the foot-wall has the appearance of being rich in copper and gold. The main vein was cut at about 125 ft. farther into the hill and has proved to be 20 ft. wide. The ore assays 9% copper, in addition to $\frac{1}{10}$ oz. gold and 41 oz. silver per ton. The adit gives a depth of nearly 500 ft. on the vein.——At Meteor camp the Keystone is producing unusually good ore. New ore-bins have been completed at the Meteor mine, and the company will start shipping to the smelters.——Two shifts are driving a new adit on the Nonpariel mine, which has been extensively worked and is now in shape to produce shipping ore.——The new management has received $80 per ton from ore lately shipped from the Stray Dog mine to the Everett smelter. The returns are net, after paying for a long wagon-haul, railway transportation, and treatment. The orebody is 14 ft. wide, and the place of production is 300 ft. deep.——A contract for 300 ft. of an adit on the Silver Crown mine has been finished, and the face is entirely in ore which contains silver and copper, but no assays have been reported. This property is situated in the Nespelem district, near Keller camp.—— The Colorado mine, in the same district, is about to be reopened. A vein was cut in an adit about 200 ft. from the portal which assayed $\frac{1}{4}$ oz. gold and 140 oz. silver per ton.——An Eastern company has purchased the Gold Seal mine, on Bridge creek, and has commenced operations under the management of S. L. Boyer.

Republic, June 1.

KLONDIKE.

The Klondike country proper—that is, that portion of the Yukon Territory in the vicinity of Dawson, as far as the individual miner is concerned, is on a rapid decline, owing to the immense area of ground being acquired by dredging companies. One company alone has purchased nearly all of the placer ground on the three principal creeks, namely, Bonanza, Eldorado, and Hunker, and has bonded considerably more on Dominion and other creeks. This has practically depopulated these creeks for various reasons. Where formerly hundreds of miners were working for wages or working their own ground, thus creating a demand for provisions, clothing, machinery, hardware, etc., and the transportation from Dawson to the different mining operations, now dredges are either operating or in course of construction.——An electrical dredge, capable of handling 3,000 cu. yd. of earth per day of 24 hours, will only require about 13 men to handle, at an approximate cost for labor of $100 per day. While this difference is not as yet felt by the laboring man in the Territory owing to the great amount of preparatory work under way by the different dredging companies, and the construction of a railroad from Dawson to the various creeks, eventually it will make a difference in the amount of labor required. The present scale of wages for laboring men is $4 per day and board, and from $5 to $7 and board for skilled mechanics, the board costing the companies $2 per day. These are the wages paid by the large companies, but the wages around Dawson are probably a little higher.—— This new method of mining, while it affects the individual placer mining in the Klondike district, has a tendency to cause the prospector and miner to look for new fields, both in the Yukon Territory and Alaska. It gives the small mine owner an opportunity of obtaining a fair price for a piece of ground which would hardly pay him to work by the old method of wood fire or steam thawing; and were it possible for him to work it by improved methods, his property is not of sufficient size to pay him to do this. It has also caused great activity in the locating of all ground open for staking in this vicinity that has not been heretofore thought of sufficient value to work, the locator only doing enough work to keep it represented until he has an opportunity to unload on one of the large companies. In this way entire creeks have been staked during the past two years.

The total amount of gold exported from the Yukon Territory during the year ended Dec. 31, 1906, according to the records, was $5,230,600, of which $33,540 was from Alaska, the balance being the product of the Yukon Territory. The records of the Alaska Pacific Express Co., at Dawson, show that $5,930,670 worth of gold was received by that company from points in Alaska, principally the Tanana district, for shipment to the United States. This makes the amount of gold shipped from Dawson to the United States in 1906 as follows: Canadian gold invoiced at the consulate, $5,287,067; American gold invoiced at the consulate, $33,539; American gold in transit for the United States, $5,930,672. Total, $11,251,278.

MEXICO.

JALISCO.

The Real Alto Mining Co. has been organized in Philadelphia with a capital of $1,000,000, to take over the Santiago, Las Cruces, Obscuriana, Castellena, and Peña Rejada mines in the Real Alto camp. Joseph Esherick Jr. is president, and J. R. Gillam treasurer. The properties are *antiguas;* a 2,280-ft. cross-cut tunnel will be driven.—— William H. Lees, the manager for the Cuartas Mining Co., reports that the Cuartas vein has been cut in the company's property in the Bautista camp. The vein was found in running a cross-cut from a winze in an old tunnel several hundred feet below the surface.——A good ore-shoot has been opened in the San Jorge mine of the Santa Lucia Mining Co., in the Navidad district. The main tunnel is in 900 ft., and cut the Descubridora vein at a distance of 776 feet.

SONORA.

The prediction is being made among mining men that the copper production of Mexico will be doubled during the next twelve months. The rapid development of new and rich copper properties in the northern portion of the Republic is the chief foundation for this view. In Sonora and Sinaloa new copper reduction works are being installed; and marked activity is apparent throughout the Arizona-Sonora belt.

Special Correspondence.

London.

Wolfram.—The Chastan Syndicate.—Royal School of Mines.—Gold Mining in Tasmania.—General Botha and Chinese Labor.—Spassky Copper. — Account of Progress. — Other Siberian Mining.

Wolfram, once regarded as of little value, has gradually come into prominence, and today several Cornish mines are obtaining between £150 to £180 per ton for this product. The total production of wolfram in the United Kingdom from 1877 to 1881 was only 94 tons, sold for £922. Cornwall sold 167 tons for £11,055 in 1905. The output last year was greater still, and this year promises to eclipse all others. East Pool and South Crofty are among the prineipal producers.

Mining speculators are reminded that the striking of the English gold 'reef' promised by the Chastan Syndicate is now about due. A good deal of interest is said to be taken in the matter in South Africa owing to the fact that Mr. Lennon, an ex-Government geologist of the Transvaal, made his Forest of Dean discovery during a holiday stay there. Returning to South Africa, he was captured by the Boers during the war and since his release he has spent six years tracing the Forest of Dean reef. Then he imparted his secret to a favored few, and, according to the story, a Rand mining expert, engaged by one of the best known South African houses, reported that the ore was of a true 'banket' or conglomerate character similar to the Rand ore, and that the property offered prospects of "a fair mining venture."

At the annual dinner of the members of the Institution of Mining & Metallurgy, held on May 3, Professor W. Gowland (the president) presided. The Rt. Hon. Reginald McKenna (President of the Board of Education), in proposing the toast of the evening, said he was particularly happy in assuring the assembly that the New Imperial College of Science and Technology was on the verge of foundation. He hoped in the course of the very next week it would be his duty to petition His Majesty for a charter for the new college. In this connection he wished to mention with sincere thanks the names of Hennen Jennings and Walter McDermott, who served upon the departmental committee, with Mr. Moreing and others, who gave most valuable evidence before that committee, and last, but not least, the name of their chairman that evening, whose evidence was of supreme importance. The Royal School of Mines, which had created for itself a reputation extending the whole world over, would be affiliated with the new Imperial College, and all who were interested in the special object of technical instruction in mining and metallurgy knew that the very best equipment which the world could produce was needed for their School of Mines. The president, in replying to Mr. McKenna, said it had been the aim of the Institution of Mining & Metallurgy whenever possible, to do what they could in aid of the Royal School of Mines, so that it might be worthy of the important position of mining and metallurgy in the great British Empire.

Some very fine developments are reported by the superintendent of the Tasmania Gold Mining Co. At the 1,100-ft. level east the width of the lode is 10 ft., and its value 1 oz. 12 dwt., and in two raises above this level the lode is respectively 8½ ft. wide, assaying 1 oz. 19 dwt. and 4 ft. wide assaying 15 dwt., while in the 1,100-ft. level west the width of the lode is 4½ ft., and its assay value 6¼ dwt., and in a raise above this level the lode is 8½ ft. wide, assaying 2 oz. 6 dwt. This mine is at Beaconsfield, near Launceston, in northern Tasmania.

A financial correspondent expresses the opinion that General Botha has very quickly caught the knack of expressing himself in terms of pleasantly vague sympathy, which is so great a part of the equipment of the skilled diplomat. He has acquitted himself with conspicuous success, having left a good impression in the home country without offending the tender susceptibilities of any of his compatriots in the Transvaal. Practically, there is nothing to be learned from the answer he made to the conference of mine owners; but, generally, his remarks convey the idea that he is not going to be led into any foolishness with regard to Chinese labor—one way or another. At any rate, the market seems to have been fairly satisfied with his statement.

Some progress is to be noted in the Rhodesian gold output. For the month of April the total of 49,772 oz. is

2,885 oz. above that for March and 6,749 oz. higher than April of last year. It has only once previously been surpassed—in August last, when the total was 50,127 oz.; but the past month's daily average is the best yet made, the 1,659 oz. comparing with 1,617 oz. in August, or 42 oz. more per diem.

Public interest has considerably waned in Spassky Copper. A year ago the shares were eagerly bought on the market at double today's price of £3 10s. No lack of confidence in the future of the property is, however, shown by the executive in London. The second annual report for the year ended September 30, 1906, states that the smelting operations have resulted in a working profit in Siberia of £30,962. Having regard to the fact that until the new plant is completed, smelting operations and the profits arising therefrom cannot be looked upon otherwise than as transitional, the directors are of the opinion that these preliminary profits should, in the same way as last year, be employed in writing off initial expenditure pertaining to the formation of the company and development of the mines. Since the date of the balance sheet a further sum of £62,500 has been received in respect of the issue of the remaiuing 25,000 shares, and the authorized capital of £300,000 is therefore now entirely issued. The company has been authorized by the Czar to operate in its own name in the Russian

Empire. The properties that have been held in the uame of the vice-chairman of the company are now being transferred into the name of the company itself. The directors indicated last year that they had decided to erect new works capable of producing upward of 300 tons of copper per month, and, simultaneously, to construct a railway from the Karagandy coal mines to the smelters, aud to re-eqnip the Yuspenssky and Karagandy mines. The erection of the works was actively continued during the summer, but building operations were, necessarily, suspended during the winter months. They were, however, recommenced on April 13, and the completion of the works is expected toward the end of the present summer. The amount of copper smelted during the year has been governed by the amount of transport available, which, in turn, has been affected by the demand for transport created by the new construction and railway works. Although the aggregate of transport was considerably greater last year than the previous year, the major part of it was necessarily diverted from the cartage of coal and ore to the transport of machinery and material, and smelting suffered proportionately. Production was, however, maintained until the new construction works were begun, after which smelting proceeded irregularly and at intervals. In all, 814 tons of copper were produced by the old smelters, realizing £88,677, an average of £108 18s. 9d. per ton. The copper was over 99.5 per cent.

In other parts of the Czar's dominions gold-dredging continues to excite a certain amount of interest. It is rumored that C. W. Purington, whose experience in Alaska, Oroville, and other gold-placer districts is well known to readers of the MINING AND SCIENTIFIC PRESS, is about to proceed to Eastern Siberia under the auspices of The Russian Mining Corporation, Ltd. Mr. Purington is to head an expeditionary party charged with the examination of extensive gold-bearing gravel properties on the Tumine and Koltchan rivers.

Salt Lake, Utah.

New Companies Organized.—Shipments From Tintic.—Utah Copper Co.—Honorine Mining Co.—Local Business.—Newhouse Corporation.

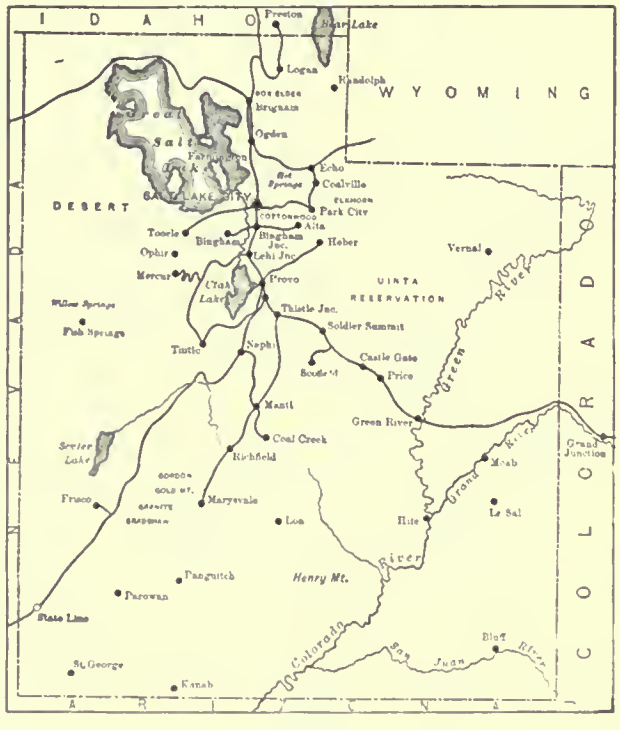
The Lakeside Copper Co., operating on Promontory Point, west of Ogden, has begun prospecting by means of churn-drills.—— A leasing company has been organized at American Fork to operate the Sunday mine, from which lead-silver ore has been shipped in the past.—— The old Lincoln mine in Beaver county is to be operated again, it having been recently taken over by a syndicate of Denver capitalists. The Lincoln group contains the first mining claim patented in Utah.

The ore shipments from the Tintic district last week amounted to 130 carloads, the contributing mines and respective amounts being: Ajax, 2; Bullion Beck, 9; Beck Tunnel, 12; Carisa, 6; Colorado, 10; Centennial Eureka, 42; DePue, 6; Eagle & Blue Bell, 4; Eureka Hill, 2; Grand Central, 2; Lower Mammoth, 7; Godiva (concentrate), 7; Scranton, 6; Swansea, 1; Uncle Sam, 8; Yankee Con., 5; Victoria, 2 carloads.

An Eastern syndicate is negotiating for the purchase of the property of the Jennie Mining Co., in the Gold Springs district of Iron county. This mine was recently equipped with a mill, which is now treating 40 tons of ore per day.—— Articles of incorporation of the Iron King Consolidated Mining Co., which will operate in the Tintic district, have been filed. The officers are: C. E. Loose, president; Reed Smoot, vice-president; J. T. Farer, secretary. The headquarters of the company will be at Provo.

A statement from the management of the Utah Copper Co., is to the effect that 800 tons of ore was treated daily at the Copperton mill in lower Bingham cañon during the month of May. It is expected that the average will be nearer 1,000 tons during the present month. A portion of the first unit of the new Garfield plant is in operation and the management hopes to have this entire unit in operation by the 10th inst.——The minority shareholders of the Honorine Mining Co., of Stockton, who entered a protest against the action of the directors in levying an assessment of 20 cents per share, after making a thorough investigation of the company's affairs, have reached the conclusion that the members of the board took the best means toward liquidating the present indebtedness of the corporation, which amounts to approximately $300,000. The pending assessment, if paid, will bring $100,000 into the treasury of the company. During the past ten months the mine yielded 54,000 tons of ore, from which was realized $68,000.

The Markham Gulch Milling Co. has its new Bingham concentrator in successful operation; the first run being made on a 6,000-ton lot of ore from the Utah Apex mine. It is expected that steps will be taken toward the enlargement of the Garfield smelter of the A. S. & R. Co., before the close of the present year. Preparations for the starting of the initial unit of the Utah Copper Co.'s new mill at Garfield are about completed. It is planned to have some of the equipment running on ore during the first week in June.



Utah.

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Samuel Newhouse has made the announcement that his corporation will be on a dividend-paying basis in July and it is gratifying to note that the payment will equal not less than 20% on the company's capital, or $1,200,000. Two such payments annually would amount to $4 per share. The May earnings of the Newhouse corporation will be close to $200,000. New equipment is being installed in the mill, which will bring the capacity up to 1,200 tons per day.

John Weir, the president of the Utah Nevada Mines & Smelters Corporation has made a statement to the effect that since paying for the Pioche properties, the company has a cash balance approximating $150,000 and 120,000 unissued shares out of a total capitalization of 1,500,000 shares.

A suit brought by Jesse W. Fox of Salt Lake against the Beck Tunnel Consolidated Mining Co. has resulted in a verdict for $240 in favor of the plaintiff, who sued to recover 4,000 shares of stock and $1,260 in dividends. The judgment is for the value of the stock sold at a delinquent sale in 1905.

The ore and bullion settlements reported by Salt Lake banks last week aggregated $358,000.

Denver, Colorado.

Zinc Production Increasing.—Magnetic Separation.—Graduates From Mining Schools.—How Mining Engineers are Made.

The mineral complexion of a State changes no less from year to year than does its political complexion. Colorado is developing into one of the great producers of zinc. It is only a few years now since the plant of the United States Zinc Co. was established at Pueblo, but already it has been enlarged to one-third greater capacity, and an additional furnace of 240 retorts, adding another one-third, is in process of construction. The great problem with the zinc ores of Colorado is to free them from the iron, copper, and lead sulphides with which they are associated. It is impossible to treat the ores for zinc unless these have been almost completely removed, as about two tons of fuel are required to treat one ton of zinc ore. In consequence, the ore must be high in zinc to enable the reduction of the ore to be done profitably. The separation from the galena is an easy matter, as the two minerals differ widely enough in specific gravity to enable them to be readily separated by ore-dressing processes. But to free zinc-blende from pyrite and chalcopyrite is not so easy a matter. The method by which it is usually performed is to subject the ore to a light roast, just enough to make the pyrite slightly magnetic. The ore is then passed through magnetic separators, the non-magnetic product containing the zinc. But this is attended with a difficulty. The ore as charged to the roasters is moist. By contact action the resultant fumes contain an appreciable amount of sulphuric acid that manifests its presence by killing the surrounding vegetation in the summer months. Consequently, in order to avoid damage suits, it is necessary to employ some process that makes this preliminary roasting unnecessary. This is attained by using a different type of magnetic separator, by means of which the zinc is removed directly, without any preliminary roast. Thus the farmer is satisfied, and the reduction of zinc ore is enabled to proceed. With the increasing number of mills to dress the complex ores of the San Juan, and the growing output of Leadville, the production of zinc seems likely to gain in importance.

This is the time of year when the newly fledged mining graduate issues forth from our technical schools, to make application of the theoretical and practical knowledge he has gained, and to win renown and fortune, if he may. Colorado contributes, as by right she should, her share to the total: Thirty-five young men have just taken their degrees in mining and metallurgy at the State School of Mines at Golden, and two at Colorado College, at Colorado Springs, where a department of mining and metallurgy has recently been established. It is now no longer necessary to argue the value of a technical education. No young man can pass through a technical course without deriving great benefit from it. But many young men do not derive as much benefit as they ought, for the reason that it is not until after they have graduated that they come to see clearly what was the real import and purpose of their technical training. Especially is this true of the young man who has had no previous experience in mining. He usually labors under the delusion that he has gone to his technical school to learn mining, and that when he graduates he will be perfectly capable of assuming the direction of important enterprises. The real truth is that he has gone to the technical school to learn *to study* mining, and if he could only appreciate this important fact at the beginning of his course he would be correspondingly the gainer. No mining school entertains the belief that it makes mining engineers; its sole duty and purpose is to familiarize the student, as far as it is practicable, with what has been learned by others concerning his profession, to give him practice in accurate methods of experimentation, to train him to accuracy of observation and logical methods of thinking, and then send him out to make himself, as quickly as his measure of ability will permit, a mining engineer. This important fact few mining graduates realize upon graduation, and as a result they take themselves too seriously. But, like the puppy that chews the soap and his master's shoes, until he comes to realize that soap and shoes are not just what he took them to be, the mining graduate generally comes quickly to know that experience is acquired in no other way than by going out and getting it; it is not to be purchased at the second-hand store. Then he has his "second wind," and is ready to begin to take his place in the ranks of the mining engineers and metallurgists.

Cripple Creek, Colorado.

Successful Leases.—State Officials as Mine Operators.—Decision in Portland v. Independence Suit.

The Western Investment Co., operating the Specimen claim of the Stratton estate on the south slope of Bull hill, is shipping from two to three cars of ore per week. Small high-grade streaks are being mined on the third level north of the shaft. Development is being done south of the shaft on the sixth level, where a 6-in. streak is being followed, but at present the vein is not of sufficient grade to pay for shipment. The same leasing company is also driving at a depth of 800 ft. east and west of the Orpha May shaft for the extension of the Lucky Guss veins.

An option has been obtained by E. Lyman White, formerly State Commissioner of Mines, John M. Maxwell, Judge of the State Supreme Court, and Prof. Flick of the Colorado State School of Mines, on the Mary Cashen mine in Victor. The property has, until lately, been operated under lease by the Arequa Gold Mines Co., which has done considerable development on the lower levels. The control of this company was bought by the above-mentioned parties from Eastern capitalists. At a depth of 800 ft. the level has been driven north from the shaft toward the Granite property to encounter, if possible, the rich orebody that produced in the neighborhood of $30,000 on the 700-ft. level.——A strike has recently been made on the Lottie claim on the west slope of Bull hill. J. A. Beckman and H. G. Moore are operating a lease on block 231 of the Stratton estate, which comprises a portion of the above claim, and while trenching they uncovered a vein at a depth of 15 ft. showing rusty gold in many places. One sample gave returns of $300 per ton. The find is only 75 ft. from a a shaft through which operations will be conducted. A small shipment of the higher grade ore is to be made.

At the termination of two weeks' strenuous legal fighting in the United States District Court at Denver the case of the Portland Gold Mining Co. r. Stratton's Independence, Ltd., has come to an end with a verdict in favor of the defendant company. Judge Lewis ruled that the attorneys for the Portland company had brought their case in trespass, but had failed to prove it by the

evidence presented. The suit was for approximately $150,000 for ore alleged to have been taken by the defendant company and its lessees from Portland territory. Dorsey & Hodges of Denver are attorneys for the defendants and Tyson S. Dines for the plaintiff.

Butte, Montana.

Production of Copper.—Increase During May.—Company Suspends Work.—Afro-American Enterprise.—Pittsburgh & Montana.—Tuolumne Copper Co.—British-Butte Company.

The copper production of the Butte district in May amounted to 29,019,550 lb., about 1,500,000 lb. more than in April. Out of the total the Washoe smelter produced about 18,000,000 lb. in May. The yield of copper per ton of ore has been much reduced while the tonnage has been increased. The Anaconda, Butte & Boston, Parrot, and Trenton mines are hoisting comparatively little first-class ore. The high-grade ore in nearly all of the Amalgamated mines is being blocked out and held in reserve against the time when copper prices drop and it becomes less profitable to mine the low-grade stuff. A great deal of ore that runs below 3% copper is mined, much of it running 2½% and even lower. At the present prices of copper this ore can be mined at a profit. The following table gives details of the output in May:

Company.	Tons of ore.	Pounds per ton.	Total pounds.
Boston & Montana	3,500	67	234,500
Anaconda	4,250	61	259,250
Butte & Boston	600	60	36,000
Washoe	400	59	23,600
Parrot	350	58	20,300
Trenton	380	60	22,800
North Butte	1,300	92	119,600
Coalition	1,550	65	100,750
Original	950	62	58,900
East Butte	200	80	16,000
Pittsburgh & Montana	225	70	15,750
La France	200	68	13,600
Miscellaneous	200	75	15,000
Total	14,105	66	936,050

The total ore and copper produced by the various companies for the month were:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	108,500	7,269,500
Anaconda	131,750	8,036,750
Butte & Boston	18,600	1,116,000
Washoe	12,400	731,600
Parrot	10,850	629,300
Trenton	11,780	706,800
North Butte	40,300	3,707,600
Coalition	48,050	3,123,250
Original	29,450	1,825,900
East Butte	6,200	496,000
Pittsburgh & Montana	6,975	488,250
La France	6,200	421,600
Miscellaneous	6,200	465,000
Total	437,255	29,017,550

. The Butte Copper Exploration Co. has suspended work on the Six O'Clock group of claims on the east side of the district. Many persons bought stock under the impression that the company owned the ground and had title to the claims it has been working, but it only has a lease and option, which will expire in August. The company was capitalized for $500,000 and all the stock was issued, but it is stated now that only $150,000 was realized, although many persons who were let in "on the ground floor" paid $3 per share for the stock. There was a good shaft on the Six O'Clock when the company took over the property and it was sunk to a depth of 1,000 ft., from which point a cross-cut was driven north. A big vein was cut and some driving was done on it, but no commercial ore was found, and the treasury became exhausted. The backers of the company are some financial men of high standing, including the Leopolds of Chicago, Hayden, Stone & Co., Richardson, Hill & Co., and Paine, Webber & Co. of Boston. The directors of the company are N. Bruce McKelvie, Frank E. James, and Thomas Dee of Boston; A. E. Leopold and Warren Nichols of Chicago, and E. A. Nichols and J. E. Corrett of Butte. At one time the stock sold at $7.50 per share, but lately it has been offered at 25 cents. Some of the owners of the claims say an extension of the options is sought, but men interested in the company, residing in Butte, deny that. If the options are allowed to expire and the property reverts to the owners, the stockholders will lose all the money they invested.

The Afro-American Mining & Milling Co., composed entirely of colored men of Butte and New York, has increased its capital stock from $200,000 to $500,000 for the purpose of purchasing additional properties. The company now owns 18 claims, eight of which, comprising 100 acres, are in the Butte district. One group adjoins the Big Bonanza mine, and several claims are in the Meaderville district. Five full claims are in Madison county, upon which considerable work has been done, and a group of five claims is situated in the Willow Creek district of Lewis and Clark county. On the last a shaft is being sunk and an adit driven, the latter being in about 100 ft. on a vein from which some good assays of copper, silver, and gold have been taken.

The Boston & Montana Co. is placing in position its new hoisting-engine at the Pennsylvania mine. The engine is a direct-acting Corliss with 32 by 72 in. cylinders, and will be capable of working to a depth of 3,200 ft. Its weight is 500,000 lb., and it will lift 24,000 lb. The shaft of the Pennsylvania is between 1,700 and 1,800 ft. deep, and with the new engine this depth can be doubled. A new steel head-frame will be erected at the Pennsylvania, and new boilers, machine-drills, and compressor, are being added. It is the intention of the company to resume sinking on the shaft as soon as the new equipment is in place and carry it to a depth of 2,500 ft. without stopping. The Pennsylvania mine is yielding about 1,000 tons of ore per day, and has been doing that for years.——The new engine ordered for the Tramway mine, a duplicate of that being placed at the Pennsylvania, has been shipped from the East, but has not yet arrived in Butte. The foundation for it at the Tramway has been completed for some time and an iron building is being erected over it. The Tramway shaft has reached a depth of 1,000 feet.

The Butte Coalition Co. is now producing in excess of 1,500 tons of ore daily, and the production has reached as high as 1,650 tons per day. The average yield of the ore mined now is probably not more than 60 lb. copper per ton, as the Coalition, like all other companies in the Butte district, is holding its high-grade ore in reserve, and is sending its lowest grade to the smelter while the price of copper is high. It is the expectation of the Coalition Co. to mine about 2,000 tons per day by the first of next year.—— Fifteen Calumet men, including several officials of the Calumet & Arizona Co., have formed an exploration association for the purpose of exploiting a group of claims in Jefferson county, in a district just east of Butte. They have spent about $15,000 on the property, and will put in $30,000 more in opening the mine, which has every indication of being valuable. John L. Vivian, for a number of years superintendent of the surface work for the Tamarack Co., has resigned that position to take charge of the work in Jefferson county. The work so far consists of an adit into the side of the hill, which has disclosed a vein with some likely looking ore.

The shaft of the British-Butte Co., several miles west of Butte, has reached a depth of 200 ft. The company is mining for placer gold and is sinking to bedrock. The surface of the ground was worked for gold in the pioneer

days, but no work was ever done below a depth of 20 to 30 ft. It is surmised that bedrock will be found at between 300 and 500 ft. below the surface. Good results from tests are found in every foot of the shaft, and the company has hopes of finding rich gold deposits on bedrock. A number of London men are interested in the company, and an expert named Charles Olden has been in Butte for several weeks.

Toronto, Canada.

A Deputy Minister of Mines.—Cobalt Flotations Continue.—Shipments of Ore.—News From the Mines.—A Copper Concentrator.

A. P. Low, director of the Canadian Geological Survey, has received the appointment of Deputy Minister of Mines in connection with the organization of the new Department of Mines at Ottawa. He will continue at present his duties as Director of the Survey in addition. Dr. Eugene Haanel, now Superintendent of Mines, is appointed Director of the Mines Branch.

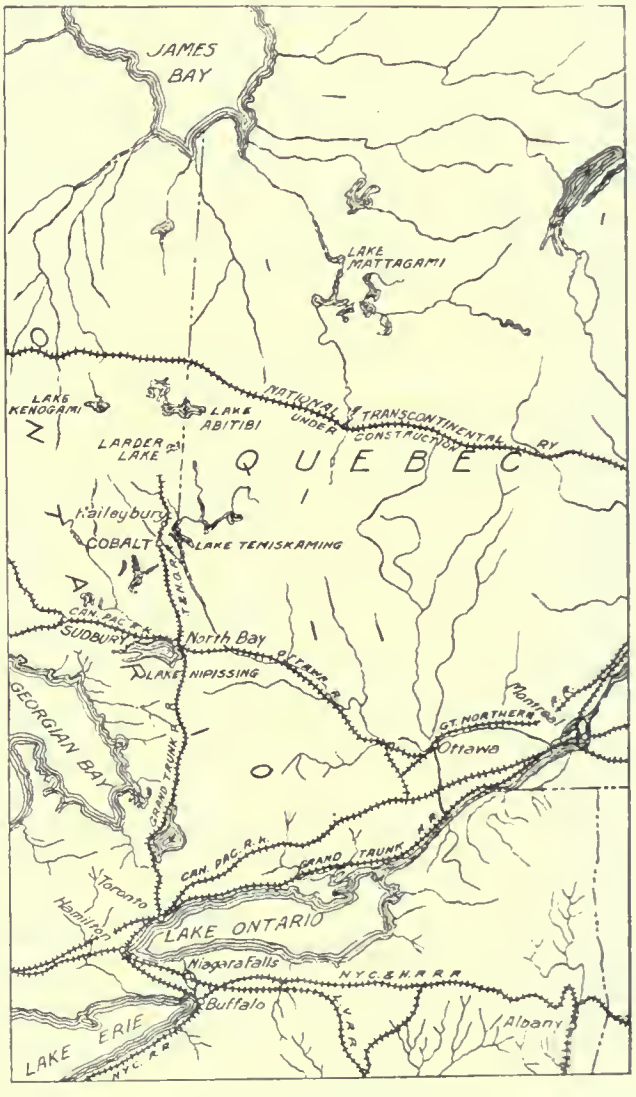
Cobalt mining stocks are much depressed, and buying by the general public has almost ceased, but there is no cessation in the incorporation of new companies, ten or a dozen of which are floated every week. Shipments of Cobalt ore, which has been light for some time, showed an increase for the week ending may 25, with a total of 435 tons, made up as follows: Nipissing, 123 tons; Trethewey, 111; Coniagas, 73; O'Brien, 63; Buffalo, 41; Townsite, 3; Cobalt Central, 20 tons. A number of the low-lying properties are idle, owing to flooding, and it will be some time before work on them can be resumed. Transportation conditions having considerably improved shipments from the chief producing mines are likely to be, large. Machinery, much of which has been for some time under order, is also coming in freely. The new vein on the Nipissing, which is considered more valuable than any yet found on the property excepting the bonanza vein No. 49, runs from 4 to 12 in. wide and has been uncovered for 200 ft. It is described as a mass of native silver from which $10,000 worth of ore has been taken in two days. One nugget, said to be 7% silver, weighs half a ton. This week the McKinley-Darragh struck this vein and is taking out enormous quantities of rich ore. The other veins of the McKinley-Darragh are also yielding well. ——It is estimated that the number of men now actually engaged in mining in the Cobalt camp is fully 3,000, and the staffs of the leading mines are beiug steadily increased.——At the La Rose work is being started at the 400-ft. level. The shaft of the O'Brien is down 300 ft. on ore of good quality. The Silver Queen has struck a 4-in. vein of high-grade ore on a cross-cut at the 75-ft. level, and has a quantity of ore ready for shipment. At the Silbert mine on Clear lake a double compartment shaft is being put in and a cross-cut made at 200 ft. A force of 16 men is working on the Big Ben property developing three veins. One shaft is down 50 feet.

The rush up the Montreal river continues and it is estimated that fully 2,000 men have gone into the district this spring. By actual count over 100 canoes per day have been seen going up the river for some days last week. Merchants at Latchford have been taxed to their utmost capacity in supplying outfits.

At the Laurentian gold mine in the Manitou Lake district, driving at the 200-ft. level shows that the zone of rich schist is increasing with depth. Thirteen tons of dynamite are in storage half a mile from Wabigoon waiting transportation to the mine as soon as navigation permits. On three properties northeast of the Laurentian, rich indications of gold have been discovered and some good specimens are shown.

The Superior Copper Co., the leading promoters of which are Frank Parry, George Kemp, and F. C. Smith, will erect a large concentrating plant on the Ontario side, just west of the plants of the Lake Superior corporation, for the treatment of copper ore. They will build a railway five miles in length from the Algoma Central to the Superior mine, on which they have already spent several hundred thousand dollars in development work, having large accumulations of ore ready for shipment. The plant will have a capacity of 400 tons per day. The Stanley Lead Co. and the Grey & Headley Zinc Co. will establish smelters at Kingston, the city having granted them free sites and exemption from taxation.

At the Laurentian gold mine, work is progressing well; the new Knowles duplex pump and boilers installed at Crystal lake, are in operation supplying water to the



The New Mining Regions of Ontario.

mine at the rate of 500 gal. per min. Chauncey Whetmore, formerly of Sonora, Cal., is now in charge of the 20-stamp mill, which is running to full capacity. The staff has been largely increased and a new scale of wages adopted. Machine runners receive $3.25 per day; helpers, $2.90; and carmen, $2.75—an advance of 25c. per day all round. Anthony Blum, the president, will revisit the mine on the opening of navigation.

A great rush of prospectors in canoes has begun up the Montreal river, notwithstanding the hardships of the route, the river being at last accounts full of floating ice. Steamers have begun to run. Numerous development parties are going up to work on claims in James and adjacent townships.——W. F. Brunne was in Toronto this week on his way to New York, after making an inspection of the Larder Lake area for the Manhattan Cobalt

Co. He states that he visited all known discoveries, and found that the extent of the gold-bearing belt was at least 10 miles. He brought samples of free gold taken at every mile of the area. On the Manhattan Cobalt properties, situated on the trail to Lemieux lake, shafts have been put down 20 and 14 ft. In the former is a quartz vein rich in free gold.——The Blue Bell Mining Co., which is shipping a stamp-mill to Larder, has engaged W. E. Hotson of New York as engineer.——On one of the claims of the Larder Central Goldfields Co. at Lemieux lake, a good calcite vein has been discovered, the ore yielding copper as well as silver and gold.——The lack of even a good wagon-road is causing much difficulty and expense in the transportation of machinery into the Larder and Lemieux Lake districts.

Johannesburg, Transvaal.

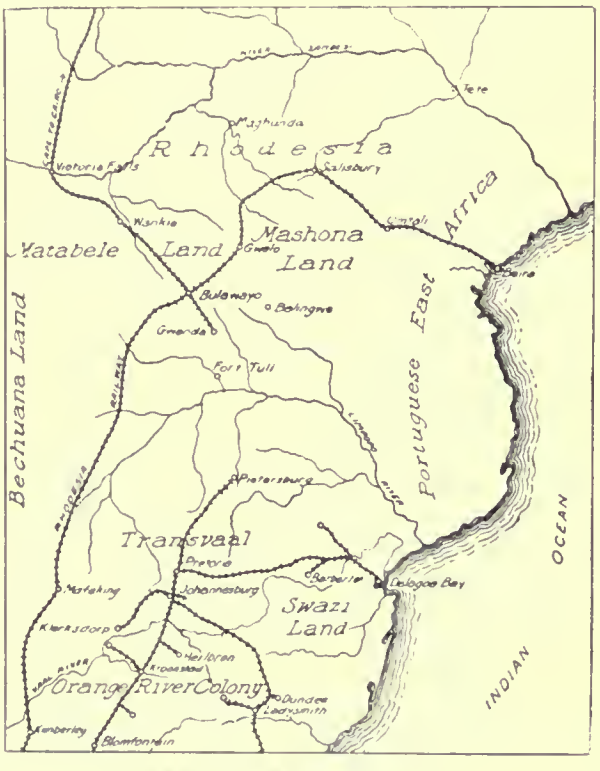
Training of Young Men.—Unhealthy Conditions Underground.—The New Metallurgy.—Unsatisfactory Results.—Another Gamble in Diamonds.

One of the problems that has engaged the minds of mine managers and others for a long time past is what to do with the thousands of youths growing up in our midst. There is an excellent institution, the Transvaal University College, where young men who are to be the assayers, surveyors, and managers of the future, can take a four years' course to learn their work, but this class is only a small proportion of the total of young men in our midst. At one time it was hoped that the expansion of other industries, such as agriculture, base metals, etc., would more than absorb the rising generation, but as there is practically no expansion going on in the country, the managers of mines have felt in duty bound to do something for the youths on the mines. On the surface, lads have been apprenticed to such trades as carpenter, blacksmith, and fitter, for some time. Many have taken advantage of this scheme, and are being trained as the skilled artisans of the future. The Mine Manager's Association has taken up the question of employing likely youths to learn underground work. The idea is to allow a young man of 18 years of age to start an apprenticeship of three years, during which time he will get experience in all branches of underground work. Only those able to pass a rigid medical test will be allowed to go in the mines. It is useless to start the weaklings in this strenuous work. The young man will start at a living wage, and every six months he will receive an increase until at the age of 21, he will be eligible for the £1 per shift.

No doubt this scheme of the mine managers is an excellent one, and many young men will take advantage of it. One deeply regrets, however, that the hygienic conditions of the mines, especially for rock-drill miners, are not much better. Competent medical men have stated that a man working continuously on rock-drills in the mines of the Rand will have an average life of seven years. A this rate a youth who puts in three years learning his trade, will only have four years in which to practice it. Of course, the underground conditions are being improved all the time and it is to be hoped that the prevention of dust and better ventilation will more than double the life of the men working underground.

Some time ago Messrs. G. A. and H. S. Denny announced, with a great flare of trumpets, the triumph of their metallurgical innovation. Several of the mines under their technical control spent thousands of pounds to install the process of circulating cyanide solutions, advocated by the Denny brothers. The following paragraph from a speech delivered at the annual meeting of the New Goch mine, by Mr. George Albu, the chairman, is rather disconcerting to the 'new metallurgy': "In addition to other drawbacks we have experienced considerable trouble with our new metallurgical plant. Whatever theoretical merits the system of circulating cyanide solutions may possess, the fact remains that the one check depended upon to ascertain the average value of the ore going into the mill, namely the screen-assay, is effectually destroyed. Our managers and technical advisers have endeavored to overcome this difficulty, but apparently without any great success, and consequently we have been frequently disappointed at the end of the month in the quantity of gold won, having been misled by the unreliable nature of the screen-assays. I do not propose to enter into technical details, but the suggestion is now under consideration to abandon the use of circulating cyanide solutions and revert to what is known as the decantation process, supplemented by the filter process."

Common caution should have prevented the introduction of the 'new metallurgy' on more than one mine, until it was proved an unqualified success. Because a



Map of the African Goldfields.

scheme works well for a few weeks it is not safe to pronounce it a success. An actual working test of a year or so is necessary when such a proposition as the new metallurgy is suggested. It is fortunate for the rest of the Rand that conservative councils prevailed, and that the mines of other groups did not take up the metallurgical schemes so persistently promulgated by the Messrs. Denny.

The Lion Hill diamond mine which had such a meteoric rise, has fallen to the earth like a stick. The stock went from £1 to nearly £20 and for awhile was the favorite horse on the racecourse, I mean the Johannesburg Stock Exchange. Today they are passed over and no doubt will pass away altogether. Another gambling bubble has burst. Great things were talked about the Barberton Copper Syndicate, and the shares were worked up to £50. Dr. Corstorphine's report throws the clear light of a trained geologist on the business, and from his report it is easy to see that the syndicate has no copper mine at all, but only a prospect of doubtful value. And yet when another such scheme comes along, people will buy the shares.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE percentage of gold extracted by the appliances on a dredge is uncertain; it ranges from 60 to 90%, with a leaning to the smaller proportion.

FLOURED QUICKSILVER is recovered in the barrel in which the battery residue is treated at the time of a clean-up. Some of it is arrested on the blanket-tables or in the canvas-plant.

THE Brunner-Mond and De Laval spelters are both high-grades of metal, but do not fetch quite so good a price as the Bertha and Horsehead brands of the Bertha Mineral Co. and New Jersey Zinc Co. in this country.

A 'BLOW-OUT' is a large body of quartz, irregular in shape, and without persistence in depth. It has none of the regularity of form associated with a vein, nor has it the continuity characteristic of lodes generally. Some 'blow-outs' in Nevada are of vast size and appear to be encasing shells developed upon the upper side of laccoliths.

FLUORSPAR, or fluorite, the fluoride of calcium, CaF_2, although it occurs widely associated with other minerals in veins in many geological horizons, is found in commercially important quantities in but few places within the United States, though there are reported to be other deposits which could be exploited to advantage if transportation facilities were adequate.

ASIDE from the various forms of rock gypsum, two less massive forms of the mineral are to be noted as being of commercial importance. In certain Western States and Territories, deposits of earthy gypsum, gypsum earth, or gypsite occur. These deposits contain an impure, earthy, granular form of gypsum. Deposits of gypsum sands are also found in the West, being dunes or heaps of fine grains of gypsum.

IN America, particularly in Texas, black flint pebbles occur in quantity on the banks of the Colorado river. Some pebbles are also found in Florida, California, and Kansas. In Colorado and other mountainous States there occur numerous white, light gray, or drab flints or cherts which may some day be utilized. Since the introduction of the tube-mill for fine grinding of mineral substances there has been a rapid growth in the demand for flint pebbles.

DEPOSITS of amorphous phosphate rock are known in various geological horizons from the Silurian to the Tertiary, and they are forming at the present time in many parts of the world. Important deposits have been reported from several States, but all of the domestic supply comes from Florida, South Carolina, and Tennessee. Arkansas, which was formerly a producer, but dropped out of the list in 1904, has become active again in 1906.

ROCK GYPSUM occurs in the form of beds, frequently closely associated with beds of rock salt, and almost always interstratified with thin beds of limestone and thicker beds of red shales. Such gypsum beds may vary greatly in extent, as well as in thickness. Beds now worked in different American localities, for example, vary from 6 to 60 ft. in thickness. The gypsum occurring in the beds frequently contains a considerable percentage of impurities.

THE lavish manner in which the United States has consumed the products of its forests and the rapidity with which our timber supply is melting away are wholly unappreciated by those who have never given the matter more than passing consideration. Familiar as all are with the use of wood for every purpose and in every industry, it is only when the various items are added that there begins to come a realization of the indispensable place the forests fill in the national economy.

A CORRESPONDENT asks the following question:

Suppose the hammer in an air-hammer rock-drill weighs 3 lb., the diameter is 2 in. and the stroke 3 in. Neglecting all frictional resistances, loss of air, etc., under a pressure of 100 lb. on the hammer, what would be the weight of the blow struck by the hammer?

Initial pressure of air = 100 lb. per sq. in. Not knowing the pressure effective in the cylinder nor the size of aperture, we shall have to assume wire-drawing losses and take the mean effective pressure at 65 lb. per square inch.

Diam. piston = 2 in., area = 3.1416 square inches.

Mean effective force on piston = $65 \times 3.1416 = 204.2$ lb.

Work done = force × distance.

$= 204.2 \times 3/12$ (3-in. stroke).

$= 51.05$ foot-pounds.

As the work is all done on the hammer, and the friction is neglected, the work can be measured by the change in kinetic energy of the hammer.

Change in kinetic energy $= \frac{w}{2g}(v_1^2 - v_0^2) = 51.05$ ft. lb.

Since the hammer starts from rest, in this case $v_0 = 0$ and

$$v_1^2 = \frac{51.05 \times 2 \times 32\,2}{3} = 1{,}095.7$$

$v_1 = 33.1$ ft. per sec.

The blow would be about equivalent to dropping a hammer of this weight freely for 16 feet.

A MINING CLAIM was located in 1904 by *A*. The annual labor for 1905 was properly performed. At the end of December, 1905, or on January 1, 1906, one day's work was done. Nothing more was attempted during 1906. In February, 1907, *A*, being a non-resident of the State, causes the claim to be re-located for himself through an agent. Thereafter *B* re-located it. Which has the right of possession?

The claim was subject to re-location in January, 1906, and at any time thereafter, and prior to February, 1907. The one day's work was not a sufficient resumption to prevent re-location. The question stated in the inquiry is to be solved by determining the legal value of a re-location made by *A*, through his agent in February, 1907, such re-location being based upon *A*'s own neglect to do the assessment work for the year 1906. So far as the State Courts have dealt with this question, they support the right of the original locator to re-locate his claim under the circumstances stated. If this rule be sound, *A*'s title under his re-location would take precedence over *B*'s. None of the Federal Appellate Courts have had occasion to pass upon the question. It was before the Supreme Court of the United States at one time, but the appeal was dismissed without decision on the merits. The text-book writers concur in the view that a delinquent locator cannot take advantage of his own delinquency to create a new estate in himself by re-locating. If their views be adopted, *A*'s re-location is invalid, and *B* will hold the ground. Notwithstanding the decisions of the State Courts above referred to, the question is considered to be an open one. It will require a ruling from the Supreme Court of the United States to settle it definitely.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Assay of Cyanide Solutions.

The Editor:

Sir—Having noticed the schemes for the 'Assay of Cyanide Solutions' in the PRESS of March 5, by Mr. Gendar, and of May 4, by Mr. Muir, I wish to call attention to the following well-known method, which I have found quick and accurate.

To a convenient quantity of KCN (working solution) add an excess of weak copper sulphate solution. Acidify with dilute sulphuric acid. Filter the precipitate, which is white (or light-bluish green) and flocculent, and which contains all the gold and silver. Wash the precipitate twice with hot water; dry filter-paper and contents by placing them in a crucible and heating in a muffle; flux filter-paper and precipitate, fuse, cupel, part, and weigh.

To solutions weak in KCN add a small piece of KCN salt, in order to give a good precipitate of copper cyanide.

AUGUSTUS MACDONALD.

Zacatecas, Mexico, May 17.

Cyanide Practice at Copala.

The Editor:

Sir—In regard to saving cyanide in the treatment of gold and silver ores, we have been enabled by a simple method to reduce our cyanide consumption from 4.5 to 1.5 lb. per ton of ore treated, and the results are so interesting that I herewith tender them for publication.

When we first commenced treatment in October 1905 our protective alkalinity in the working solutions was carried at 0.04% (in terms of caustic soda), and the cyanide consumption varied from 4.3 to 4.5 lb. per ton of ore.

The ore is valuable for its silver, which occurs as a sulphide, and carries from 12 to 20 oz. of this metal per ton, together with a small quantity of gold. We find that 5.2 lb. of lime per ton is sufficient to keep the alkalinity at 0.04%. Our extraction has been good, averaging 93% of both gold and silver, and, accepting the fact that a certain amount of cyanide will of necessity be constantly tied up as a double cyanide of zinc and sodium (using sodium cyanide), we have not considered the amount abnormal, though the advisability had been discussed of installing electrolytic precipitation to obviate this loss of potential free cyanide. However, in reading over 'The Cyaniding of Gold and Silver Ores,' by Julian and Smart, I noted what was said (page 99) in regard to the decomposition of the double cyanide (Na_2ZnCy_4) by an increase in the free alkali. W. R. Feldtman is there quoted as saying: "The addition of alkali to working cyanide solutions which have become somewhat weak in alkali, brings up the strength by regenerating, i. e. decomposing, the zinc cyanide, so that as a matter of fact, when the solutions are pretty strongly alkaline they contain no zinc as cyanide, but only the hydrate dissolved in alkali."

With the object of ascertaining what results could be obtained by increasing the alkalinity, I commenced adding lime, and kept gradually increasing the same until the solutions tested 0.2% alkalinity. Our working solution for slime, which we carry at 0.125% KCy, at once began to gain in strength, and kept growing gradually stronger until it showed 0.3% KCy; the alkalinity was then allowed to fall to 0.09%, when cyanide strength also fell. After many experiments with various strengths, I found 0.135% to be the least alkalinity with which I could regenerate, and consequently I have kept the alkali at that strength ever since.

As a result of this regeneration, our cyanide consumption has not exceeded 1.5 lb. per ton treated for more than five months; as a matter of fact, no cyanide was added to the slime-treatment solutions for nearly 13 weeks, and the amount used to bring the leaching-plant solutions up to strength was small; this of course was due to the large excess of zinc cyanide then existing in the system.

In regard to the testing for alkali, we first determine the free cyanide by titrating with standard silver nitrate solution to the first faint opalescence, without the use of the potassium iodide indicator; we then add a few drops more of the silver nitrate to make the opalescence well defined, and titrate with N/5 oxalic acid solution using phenolphthalein as indicator. This is the method recommended by J. E. Clennell, and as it has been found to check very closely with L. M. Green's ferrocyanide method, and also with that of Gerard Williams published in the *Journal* of The Chemical Metallurgical & Mining Society of South Africa, it has been adopted by preference on account of its simplicity.

Finally, I would say that up to date there is no indication of increase in our cyanide consumption, and as this work has been going on for the past five months I have come to the conclusion that the regeneration has assumed constant proportion.

L. McN. B. BULLOCK.

Copala, Sinaloa, Mexico, May 4.

Copper in Serpentine.

The Editor:

Sir—In the issue of February 23, Mr. C. Y. Knight notes an occurrence of bornite flakes in serpentine on a claim at Shingle Springs, El Dorado county, California. Although I have not seen the serpentine occurrence referred to, I have examined in considerable detail the portions of the northern extension of the serpentine belt in Siskiyou county, California, and Josephine county, Oregon. Presumably the serpentine of the north is similar in composition and origin to that of El Dorado county.

Contrary to the suggestion of Mr. Knight, I am of the opinion that the serpentine is an alteration from an original basic igneous rock, a peridotite or olivene diabase. In the northern counties the belt is very extensive and characterized by the occurrence of peculiar and interesting mineral associations. Copper in the form of chalcopyrite occurs in lenses at various points, without quartz or other gangue association, as far as I have observed. That the original basic rocks from which the serpentine is derived contained indigenous metals is highly probable. The alluvial gold deposits of this region contain a small amount of platinum. The fact that this platinum was an original constituent of the peridotite is fairly well established. An association of nickel and copper with platinum as original constituents of basic rocks is not infrequent, although the form in which these metals may occur in the rock matrix is uncertain. Even the chalcopyrite lenses in the serpentine of Josephine county are probably due to secondary segregation. In any case the bornite flakes noted by Mr. Knight would be the result of a change—perhaps more than one—from the original copper occurrence. For this much is generally believed; that bornite is secondary, frequently after chalcopyrite.

If it be allowed that the original country rock was a peridotite, diabase, or gabbro, now changed to serpentine, it would be strange if changes in the form of metallic minerals did not accompany this rock metamorphism. The original mineral with copper content may have been

iron pyrite. It may have been pyrrhotite or chalcopyrite. In the course of examination of a large copper deposit I once had delicate assays made of specimens of fresh olivene-diabase remote from any mineralization. Traces of copper were found in every case. Thin sections of the same rock showed the presence of a small amount of iron pyrite and no other metallic sulphide. In Silver Bow Basin, Alaska, I have seen indigenous pyrrhotite heavily impregnating a basic gabbro.

The relation of copper and copper ore to basic rocks is one of fascinating interest, and it seems to me that the researches so far pursued have been less satisfactory in results than many other branches of inquiry into the character of ore deposits. Mr. Knight raises a timely question, and I beg leave to submit the above remarks in the way of calling attention to the importance of the query, rather than as an explanation.

C. W. PURINGTON.

Munich, April 15.

Assay of Cyanide Solution.

The Editor:

Sir—Mr. Gendar's modification of the Crosse method given in your issue of March 30 is quick and accurate, but while doing away with tedious evaporation and chance of loss in the furnace, it is open to the objection that it cannot be used for the estimation of the silver. Seeing that the cyanide process is becoming widely employed on silver ores, this is a great objection. In the majority of cases some modification of either the Argall or the Chiddey method will fit in nicely with solutions carrying gold or silver or both; but the Argall method, necessitating either scorification or pot-fusion, gives the preference to the Chiddey method. At the Queen Esther mill at Mojave, California, and the Tombstone Consolidated Mill at Tombstone, Arizona, I have found the Chiddey method to meet all requirements on solutions running from traces up to 7 oz. Ag and 0.25 oz. Au.

The following is the Chiddey method now used here: Take 292 c.c. (10 A. T.) solution in a large beaker; add 5 gm. zinc shaving and 40 c.c. of a 20% solution of commercial lead acetate. Bring to a boil and place in a fume closet or an open window, and add 40 c.c. commercial HCl. When action nearly ceases, boil again. Pour off the waste solution and squeeze the wad of spongy lead into a cube, place it between filter-paper and squeeze it dry by standing on it. By folding the cubes of lead in pieces of leadfoil the weight can be increased to about 10 gm. each, giving a better cupellation and preventing any particles of lead from being detached from the main bulk, if any moisture happens to be left in the cubes. I have found that solutions obtained in treating pan-amalgamation tailing containing mercury sometimes cause the lead to be too brittle to wad together nicely in a cube, and I have overcome this somewhat by taking more lead acetate and less of the solution.

The average of 28 determinations on Queen Esther solutions by the Argall method was Au 0.0183 oz., Ag 1.416 oz.; by the Chiddey method Au 0.0181 oz., Ag 1.438, the Argall being + 0.0002 oz. on the gold and the Chiddey + 0.022 oz. on the silver.

A curious thing about these cubes of spongy lead is that when squeezed free from the waste solution, but yet moist, they will become heated so quickly that you can detect it with your hand. This, I presume, is due to the rapid oxidation. I have not found any advantage in filling the muffle with wood-smoke as suggested by Chiddey, and I cupel these cubes just like ordinary assay-buttons.

W. F. TINDALL.

Tombstone, Ariz., April 11.

The Electric-Air Drill.

The Editor:

Sir—In the interesting page of 'Concentrates' in your issue of May 11, there is a paragraph which will be understood as referring to the electric-air drill and which conveys a distinctly erroneous impression. As a description of this drill has appeared in your columns, those who read that article with any care will not be misled; others may be, to their loss. The paragraph referred to says: "One of the later and interesting developments of compressed-air drills has been the addition of a small electric motor driving a little local compressor for supplying the operating power to the drill." This of course carries the impression that the drill is essentially the familiar air-driven drill with the compressor placed near the drill instead of in the power-house. The drill, in fact, is neither an electric drill nor an air-drill, as these have been known, and the so-called compressor is as much an expander as a compressor of air, and should rather be called a pulsator.

The same air is used over and over again, and not only its full pressure when compressed but all of its pressure during the act of compression is utilized. The air-cushioning of the piston on the back stroke also is made to increase the force of the blow, this air-cushioning being in fact a carrying over of power from the previous stroke. From being, what the standard air-drill is, a most extravagant and wasteful user of power transmitted by a column of air, the electric-air drill is the most economical of power of any of the electric, electro-pneumatic, or pneumatic tools, and at the same time it is more efficient than the drills it takes the place of. It is unfortunate in that its principle of action is so novel that it is difficult to speak of it briefly and yet give a completely correct representation of its economy and efficiency. As it gets to be better known it will also be more correctly understood and more fully appreciated.

FRANK RICHARDS.

New York, May 20.

RAILWAY CONSTRUCTION IN COLOMBIA.—The Girardot railway has 80 miles under operation and 205 miles contemplated or under construction. The road runs from Girardot on the Magdalena river through Hospicio, and is to connect with the Sabana railway at Facatativa, a distance of 80 miles, and is to be completed January 1, 1908. The Antioquia railway when finished will consist of the extension of the road from Puerto Berrío to Medellín, 78 miles. The construction of a line is contemplated to join the Dorada railway with the Puerto Berrío and Medellín railway at Providencia, 75 miles and the extension of the line from Puerto Berrío to Barranca Bermeja, 50 miles. Other engineering works contemplated or in course of construction in Colombia are: The extension of the Dorado railway from Honda to Ambalema, 66 miles; the Buenaventura railway, to Buga, and the Cambao wagon road, from Facatativa to Cambao, on the upper Magdalena river, 75 miles. Some material is on the ground for the construction of the railway from the Ciudad Reyes, on the Gulf of Darien, to Medellín. A concession has also been granted for the extension of the Northern railway, from Bogotá-Zipaquirá to Chiquinquira, 40 miles.

THE exports of tin from Bolivia increased from 3,794,494 lb. in 1897 to 27,234,944 lb. in 1905. The world's production and consumption of tin in 1905 was 93,376 tons and 94,755 tons, respectively. The United States in 1905 consumed 38,470 tons, or 40.6% of the world's production.

Goldfield, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By a Special Contributor.

It was late in 1902 that the Sandstorm claim was located on Columbia Mtn. and a number of prospectors came south from Tonopah. No important discoveries were made and interest dwindled during the spring, until the Combination vein was discovered in the summer of 1903. After this discovery, the camp grew slowly to a population of 6,000 in the autumn of 1904. At this time the Jumbo, the most important mine, was being operated by a number of lessees. On the Davis and Loftus lease on the Sandstorm good ore was being shipped by shoveling the dirt and float on the hillside. So rich was the surface ore that it was found necessary to cover the rock with bull hides to prevent loss in blasting. The next important find was made on the Quartzite mine near Diamondfield, where ore to the value of $40,000 was taken out at a small depth, but both these properties have proved to be 'bunchy' in character.

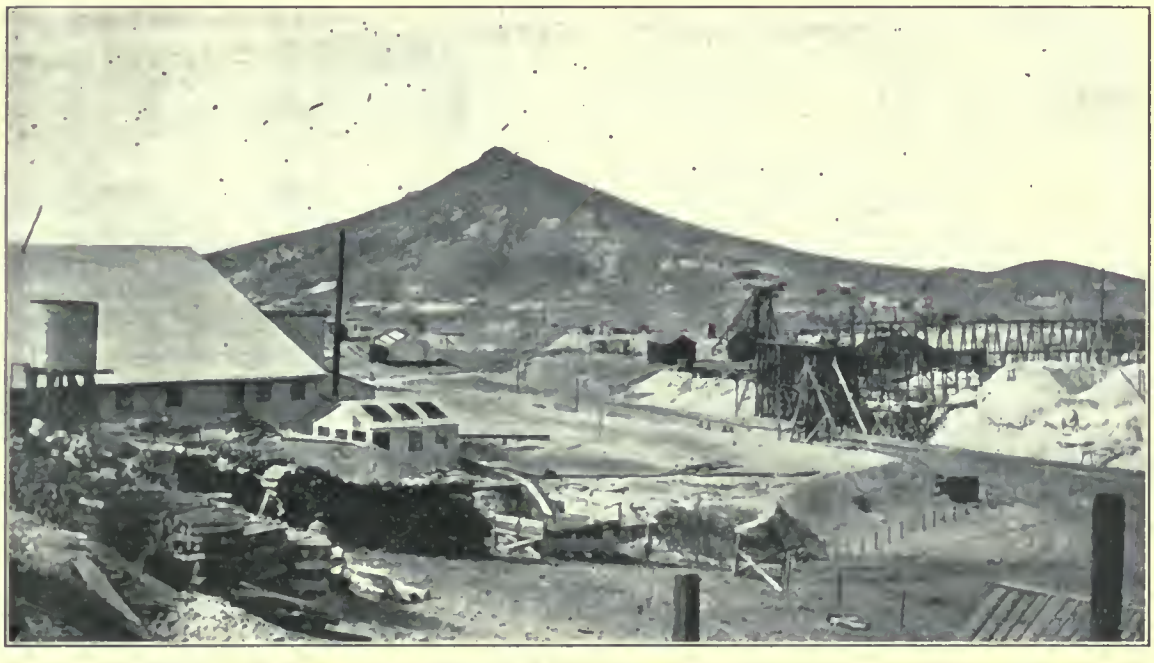
Early in the summer of 1905 the Reilly lease struck rich ore on the Florence. This was soon followed by the discovery on the Sheets-Ish lease, on the heels of which followed the opening of the great bonanza on the Mohawk, after a year's work without any results. With this discovery the demand for stock in leasing companies increased and they soon reached a greater popularity than that of the parent companies.

The discovery in the Mohawk was not without romance. At first work proceeded steadily and a shaft was sunk to 210 ft., then cross-cuts were driven at 80 ft.

Mohawk. Combination. Lava flow on top of mesa.

General View of Goldfield.

and at 210 ft., at a cost of about $15,000, but without result. The lessees were about to give up and sold a large interest for a small consideration. With this a cross-cut was driven 30 ft. on the 150-ft. level and the bonanza was found. The lode or band of mineralization had been intersected at an unproductive point. The 80-ft. level was above the ore-shoot and the 210 level was not quite long enough to reach it.



Combination mill. Columbia Mtn. Mohawk mine.

Goldfield, Nevada.

The Mohawk became the scene of intense activity. The lessees sublet the greater portion of their ground, and the Hayes-Monette, which produced more than $1,500,000, was reduced to an area of 370 by 150 ft. At one time 19 head-frames were crowded on this claim, and it had the appearance of an oilfield. So feverish was the anxiety of the lessees to make the best of their time, that surveyors could not interrupt hoisting to plumb their shafts and work was continued through Christmas day, the men being given an extra $5. High-graders, that

is, ore-thieves, made enormous hauls, and there is no doubt that over $100,000 was lost this way. It was common for the men to wear a light harness between two shirts to carry pouches full of high-grade ore, while their boots and trousers were often filled with fine stuff assaying dollars per pound. In this way a man could carry away 30 to 50 lb. each day, and this ore sometimes had a value of $5 per pound. On the expiration of many leases in December, the stealing was checked by making the men change their outer clothes in the wash-room. A general exodus of assayers occurred at the same period.

At the present time the development on the Oddie lease on the Combination Fraction is especially interesting. A shaft is being sunk to cut the Mohawk ore-shoot at about 600 ft. and this will give valuable evidence as to the character of the orebodies in depth. This lease is excellently equipped, having a two-stage compressor and hoist, each driven by a 75-h.p. motor. At Goldfield, electric power is obtained from Bishop, California,

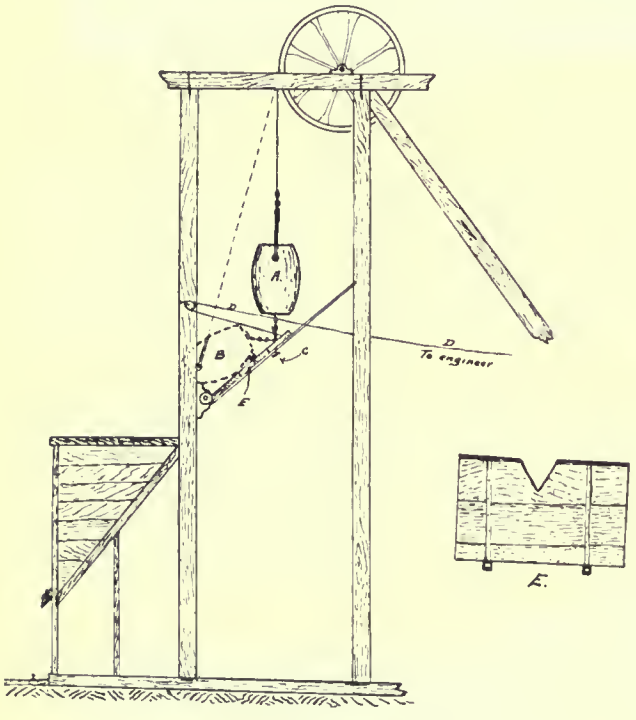


Fig. 1. Dumping Device.

whence it is transmitted at 6,600 volts and transformed to 440 volts. Electric hoists are replacing gasoline engines, the former being more reliable. The price of gasoline varies from $2.50 to $5.50 per case, while wood costs $35 per cord. A 25-h.p. gasoline hoist uses about 15 gal. per 24 hours, while electric power is about $12 per h.p. per month.

The cost of sinking at Goldfield varies from $20 to $30 per foot. Lumber at $55 is a serious item. The accompanying diagram shows a shaft sunk on the Combination mine. The shaft is 5 by 9 ft.; it cost $22 per foot, the timber alone costing $9.50 per foot. The cost of driving in country rock (a soft dacite) is only $4 to $5, and a man working alone by hand has driven 70 ft. in a month, most of the ground breaking without blasting. In the silicified zones in which the orebodies occur, the rock is hard, but the cost of driving and track-laying was not more than $5 to $7 per foot. The cost of stoping by hand is 90c. per ton.

A simple automatic dumping device is shown in the accompanying sketch, (Fig. 1). To the bottom of the bucket is attached a piece of chain or rope with a block at the end (*C*). The bucket *A* is raised to the point shown in diagram and an apron *E* is then lowered by the engineer by a string *D*. This apron is hinged and remains in a vertical position while the bucket is being hoisted, but, on being lowered by the engineer, it falls to a slope of 45°. In this apron is a V-shaped notch shown in detail sketch. This engages the block *C* when the bucket is again lowered and the bucket dumps into a car or bunker in the position *B*, a small block on the apron being used with the Cornish type of bucket.

Goldfield has the erratic topography of a recent volcanic district modified slightly by erosion. To the north is Columbia mountain, a rhyolitic peak with a mass of alaskite at its south end. Vindicator mountain has a similar origin. Myer's mountain, immediately south of the Florence mine, is a neck from which a series of

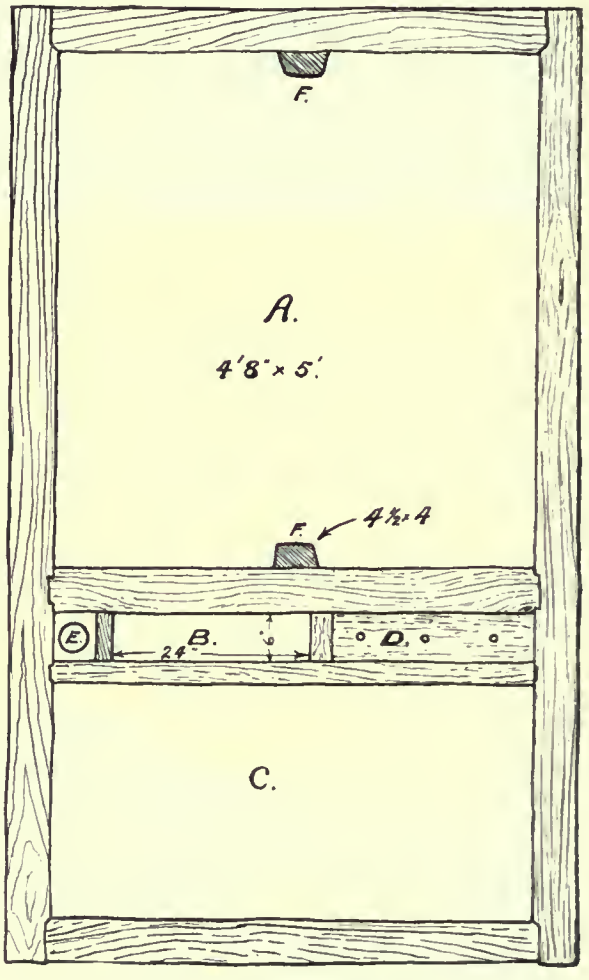


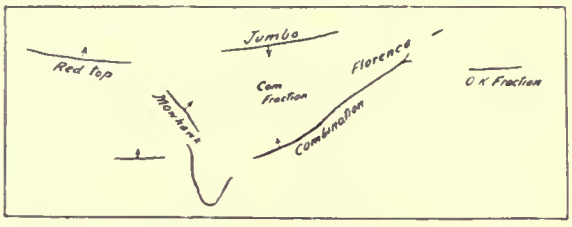
Fig. 2. Combination Shaft.

A—Hoisting compartment.
B—Compartment for balance.
C—Manway.
D—Electric cables.
E—Pump column.
F—Guides.

volcanic flows have emanated. Rhyolite flows were followed by andesites and the basalts that now crown its summit. One of the salient points in the landscape is the *mal pais* (bad land) mesa to the southwest, where sheets of lava have protected the tuffs and lake-beds from erosion.

This volcanic complex is of Tertiary age. The extent of the productive area is not yet determined. Great stress has been laid on the richness of the dacite in which the best known mines occur. But the geological evidence does not warrant this. The deposition of the valuable minerals is intimately associated with the silicification of certain bands of shattered volcanics. These are not confined to the so-called productive dacite; there seems little reason to suppose that the rich ore will be strictly confined to this narrow belt. The irregularity of the lodes is only surpassed by the irregularity of the pay-shoots. (See diagrams *A* and *B*.) The bonanzas

occur in belts of silicified volcanic rocks where other fissures seem to dip into them and enrich them. Rusty outcrops of these silicified bands break the monotony of the low hills and have naturally attracted the attention of prospectors. Of the vein system and the distribution of ore-shoots, little is known. The Combination lode, the most persistent in the district, changes in dip and strike, and developments give little information as to

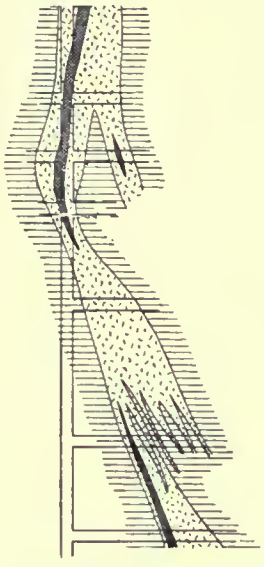


A. Plan of Vein Fractures.

any systematic distribution of ore. The rich ore occurs in irregular deposits varying from small bunches or pockets to large shoots of unknown depth. These are not always enclosed in the silicified material, but occur sometimes between it and the soft country rock. The ore is a breccia cemented by silica. The fragments themselves sometimes contain veinlets of quartz, but it is the later cementing material that has been deposited with the gold.

Silicification has taken place at several periods. After the first deposition, earth-movements have shattered the silicified material owing to its brittle character as compared with the soft rocks surrounding it. This broken and crushed stuff has been cemented by quartz with gold, pyrite, gray copper, and bismuthinite, in notable quantities. The usual gangue minerals are conspicuous by their absence. Galena, blende, and tellurides are rarely found. Of many specimens of supposed tellurides, the greater number were incrustations of gray copper (fahlerz) and some were bismuthinite. The latter occurs in fine needles and is usually associated with gold.

The extreme richness of these deposits has attracted capital and created a town out of all proportion to the basic industry of Goldfield. It has been a great distributing centre, but, with the completion of the railroad to Bullfrog, it will lose some of its importance. With the abnormal amount of development now in active progress, the immediate district will soon be fairly prospected and the character of the ore in depth will be determined. The consolidation of the principal mines has done much to remove the danger of litigation, which was threatening the camp. The attempt to define the



B. Diagram Showing Irregular Distribution of Orebodies.
After F. L. Ransome.

apex of a complex series of intersecting shear-zones of different ages, directions, and magnitudes may well become a blessing to the mining lawyers and a curse to the mining community.

Montana-Tonopah Mill in Course of Construction.

In many of the mines and leases work has been carried on without method and as a result not much systematic development has been accomplished and but little is known concerning the relationship of the different orebodies. Goldfield is in the transition stage between a young and most promising desert camp—with its usual mixture of tents and shacks, poor accommodation, and bad transportation—and a permanent mining town with hotels, theatres, and other luxuries that indicate stability. There is nothing to attract people except the mines and the business dependent on them. It would be difficult to name another camp in which such a mob can be found. Nondescript promoters, irresponsible mining engineers, 'high-graders,' and agitators, rubbing shoulders with brokers from New York and Berlin, prospectors and engineers with their burros and automobiles, all playing their game in the great casino of Nevada.

A Review of the Chemistry of Portland Cement.

Written for the MINING AND SCIENTIFIC PRESS
By F. H. MASON.

It has often been said that the prosperity of a nation may be gauged by its consumption of iron and sulphuric acid. To the consumption of these two staple articles as a barometer of national prosperity may well be added that of portland cement. Incidentally, it may be added that in each case, while the final result is more or less certain, the reactions leading up to the result are but imperfectly understood. It is a matter of fact that the leading authorities upon these subjects do not agree as to the reactions taking place in the various parts of the blast-furnace and in the lead chamber, but upon this it is not proposed to dwell. When we come to consider portland cement, we find a much greater diversity of opinion, not only in the reactions that take place during its manufacture, but also in those that bring about its setting and hardening, when the manufactured article is being put to industrial use.

The ingredients necessary to form a hydraulic cement are lime, silica, and alumina; oxide of iron may, to a certain extent, replace alumina, and, it is claimed by many, to the improvement of the cement; while it is not certain that magnesia and manganese oxide may not replace some of the alumina without detrimental results. Many natural cements are composed almost entirely of lime, silica, and magnesia, with only small quantities of alumina.

That the lime need not necessarily be in chemical combination with the other ingredients to form a hydraulic cement is evident from the fact that the ancient Roman cements—the durability and hardness of which are historic—were made by mixing fat lime with finely ground volcanic scoria, the latter being composed principally of silicates of iron oxide and alumina. It is, however, essential that the various ingredients shall be in the finest state of division in order that chemical interchange may take place.

In the manufacture of portland cement local conditions must necessarily rule the form in which the essential ingredients are assembled at the works. Thus in England we generally find chalk supplying the lime, while the other ingredients are found in river mud or clay, while in America the lime is generally provided in the form of marl or limestone, while clay or shale supply the silica and alumina. In whatever forms the necessary ingredients are assembled, it is imperative that they should be reduced to the finest state of division and thoroughly intermixed. This is generally accomplished by grinding the materials together in water; the product is allowed to settle, the water drawn off, and the residue, known as 'slurry,' dried, and burned in kilns. The clinker produced from the burning is ground, and after being allowed to season, by exposure to the air in thin layers on the floor of warehouses, it is placed in bags or barrels ready for the market.

The foregoing is, of course, simply a bare outline of the method of manufacture. It is not proposed in this article to enter into details of plant, which must of necessity vary with the different kinds of material used and with varying ideas of the designers of the factories.

Whatever the method of manufacture or of the materials employed, the lime and silica contents of all good portland cements show only slight variations. The lime generally ranges from 61 to 63%, and the silica from 18.5 to 22%. The alumina and oxide of iron are proportionately subject to a greater variation, these two substances together ranging from 12 to 16%; in European cements there is generally about twice as much alumina as iron oxide; in many American cements the alumina contents are considerably greater. The following may be considered a typical analysis of an English cement:

Insoluble matter	2.56	Lime	62.47
Silica	18.92	Magnesia	0.81
Alumina	8.76	Sulphuric oxide	0.93
Ferric oxide	4.40	Soda and potash	1.10

The insoluble matter is usually composed principally of silica, which has passed the screens in too large a form to enter into chemical combination with the other ingredients. The sulphuric oxide, magnesia, and alkalies are generally considered as impurities. Whether they will always be looked upon as such is an open question; taking into consideration the marked influence of traces of one substance upon masses of another in other industrial materials, I am disposed to think that these so-called impurities may play a far more important part than that with which they are today credited.

The sulphuric anhydride in all probability exists in the form of sulphate of lime and it is known that users of cement will often add small quantities of this substance to cement when it is desired to retard the setting.

It has been found that a cement high in lime and low in silica when properly burned will produce a material that will attain greater tensile strength than one low in lime and high in silica; it requires, however, more fuel and greater care in the burning. It is easily possible on the other hand to get too basic a cement, which will develop cracks on hardening, so as to decrease its tensile strength. Between 63 and 64% appears to be about the maximum limit of the lime contents. A cement high in alumina and properly proportioned as regards lime and silica, sets quickly and develops great tensile strength rapidly; in cases, however, where the alumina is too high, the cement will develop great tensile strength, but after a few weeks, this materially decreases—one of the worst possible features in a cement. The properties given to a cement by ferric oxide do not appear to be understood; several authorities look upon it purely as a dilutent, necessary only because of the difficulty of obtaining the other ingredients without it, owing to the wide diffusion of iron in nature. My own experience is not in accord with this. I have found that a cement in which the ferric oxide constitutes from a quarter to a third of the combined ferric oxide and aluminum contents, will generally give a greater tensile strength after three months from its setting, than one in which the ferric oxide occurs in less proportion, other things, of course, being equal. This conclusion was reached when making experimental lots of cement from varying ingredients.

There is one other common ingredient of cement that rarely appears in published analyses, namely, titanium oxide; it seldom occurs in quantities of more than one per cent, and presumably gets overlooked in the analyses, being determined either with the silica, or the alumina, or both; its source is easily accounted for, as it is a common constituent of clay. It is found in both good and bad cements, and as far as I have been able to discover, does not appear to play any part in the behavior of the material.

With regard to the setting and hardening of cement: The whole thing is imperfectly understood, and it is a most difficult problem for research. The two words, 'setting' and 'hardening,' are almost universally used; the former process in many cements is comparatively sharp; the latter is purely a gradual merging from the former state. Analyses of the cement during the stages of hardening convey comparatively little information; from it we can only learn the elementary constituents, and not the compounds into which they have resolved themselves, which is more particularly the information

desired. Some other method of investigation is therefore necessary.

The researches of M. Le Chatelier, published in the *Annales des Mines*, February, 1888, are unique, and while they will be familiar to many readers of this paper, they are so interesting and the method of investigation is so original, that a brief review of them will be pardonable. The sections of the original clinker and of the cement during the stages of hardening were cut and examined under the microscope by the aid of polarized light; various crystalline, non-crystalline, and amorphous bodies were observed. As these bodies could not possibly be separated and subjected to analysis, Le Chatelier hit upon the happy idea of synthetically building up similar crystals and comparing their optical properties with those found in the cement. At the first blush this might appear an endless task, but, while the research was a lengthy one, Le Chatelier was able to confine himself to a comparatively small field. He knew the analysis of the cement, and by neglecting traces (this in a broad sense), he could limit himself to the various chemical combinations existing between lime, silica, alumina, and ferric oxide.

The salient features of this research were the discovery in cement of:

1. A substance having no action on polarized light, crystallizing in the cubic system; similar crystals were made consisting of tricalcium aluminate $3CaO,Al_2O_3$.

2. A substance acting feebly on polarized light. Supposed to be calcium silicate $3CaO,SiO_2$.

3. A strongly brown colored substance, acting on polarized light, and swelling when moistened; a similar substance was made consisting of calcium alumino-ferrite, $3CaO(AlFe)_2O_3$.

4. Small crystals having strong polarizing action on light, not abundant, supposed to be a compound of magnesia.

During the hardening, hexagonal plates similar to calcium hydrate were always present.

In highly aluminous cements long needles of considerable dimensions, interlacing, were found; these were supposed to be due to the action of water on $3CaO,Al_2O_3$; and to be the cause of the initial setting of cement.

Other substances were found, the composition of which was not satisfactorily determined; Le Chatelier concludes that:

1. The calcium compounds of cement when tempered with water, are first decomposed, yielding calcium hydrate.

2. When tricalcium compounds are decomposed by water they form hydrated ortho-calcium silicate, and hydrated calcium aluminate. The calcium alumino-ferrite swells and appears to slake like quicklime; of no importance.

3. That the setting is caused by the hydration of tricalcium aluminate, while the hardening is caused by the hydration of the tricalcium silicate.

While I would not detract one iota from the praise due for this excellent, lengthy, and painstaking research, which will couple Le Chatelier's name with the cement industry for all time, it is fair to point out that the results cannot be accepted with the same finality that analyses of the substances found under the microscope would have, had it been possible to have separated them mechanically. Le Chatelier's researches have in many respects been borne out in practice.

As has already been stated, highly aluminous cements quickly attain great tensile strength, but they do not retain that strength. If, as Le Chatelier suggests, the setting is due to the interlacing of the long crystals of calcium aluminate $4CaO,Al_2O_3,12H_2O$, the subsequent weakening of the cement is explained, when it is shown that the calcium aluminate loses water in dry air.

It is well known that a straight silica cement — that is a cement composed almost entirely of lime and silica — will, if given time, set and ultimately attain great strength, but owing to the fact that it often requires months to set thoroughly, for most purposes it is of little industrial value. This again would appear to bear out Le Chatelier when he claims that the ultimate hardening is due to the hydration of the tricalcium silicate.

Slag cements made by granulating, drying, and finely pulverizing blast-furnace slag and intimately mixing it with slaked lime, when properly proportioned and thoroughly mixed, are excellent. The slag supplies the silica, alumina, and part of the lime, while the calcium hydrate is necessary, not only to provide the deficiency in lime, but also to bring about the necessary chemical reactions; once again bearing out Le Chatelier when he shows the invariable presence of calcium hydrate during the setting process.

With regard to the calcium alumino-ferrite; surely a substance that "appears to slake and swell like quicklime" requires something more than passing notice; for, if the swelling should take place after the hydration of the calcium aluminate, it would disintegrate the crystals and weaken the material. Every cement-maker knows and, as a matter of fact, Le Chatelier himself points out, that a good cement must not contain free lime, for this very reason. If, on the other hand, the calcium alumino-ferrite slakes immediately it is tempered with water, may it not be the means of supplying calcium hydrate and provide the lime necessary for the conversion of $3CaO,Al_2O_3$ into $4CaO,Al_2O_3,12H_2O$, and if so, may not the alumina and ferric oxide thus set free seek association with some of the silica to form stable double silicates, thus contributing to the hardness of the material? The whole subject is full of interest, and I know of no more open field for profitable research to those who have the opportunity of following it.

MINING IN ALGERIA.—A remarkable development is going on in mining in Algeria. Some of the zinc and lead mines opened last year have been successful, and the shares have doubled and in some instances more than quadrupled in value. Mines of mercury have been opened this year and are said to promise well. A feature in this department is the resumption of shipments of iron ore to the United States. About 15,000 tons have been shipped from Beni-Saf, and large shipments are announced for the present year. A concession has been given for a sulphur mine near Guelma, and work has just begun. The extraction of phosphate rock in Algeria has exceeded that of 1905, but in Tunis the output has been very much more important.

ADVICES FROM SCOTLAND indicate that negotiations are now in progress for a huge coal amalgamation in the Lothians, in which quite a large number of the principal collieries in East Lothian and Midlothian, which is a leading centre of the mining industry in Scotland, will be embraced. The capital of the combine, it is believed, will amount to about $6,125,000. The collieries will employ about 7,000 men, and it is expected that the proposed arrangement will lead to a much greater development of mining throughout the east of Scotland. The output in East Lothian has been more than trebled in the last three years. Submarine seams are now being worked under the Firth of Forth, where it is estimated that there is a coal area sufficient to give an annual output of 35,000,000 tons of coal for the next 160 years.

The Ancient River Channels of California.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE W. KIMBLE.

These channels have furnished not only a large portion of the gold produced in California, but they have afforded a most interesting subject of study ever since their discovery in the early days. They have received the attention of many geologists, mining engineers, and miners.

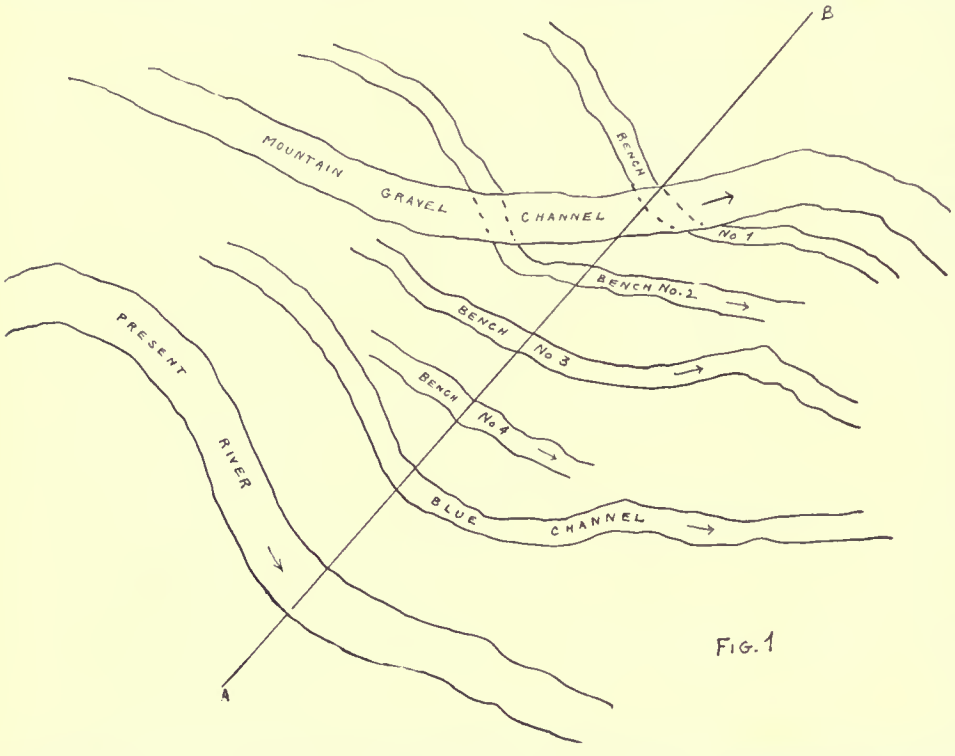


FIG. 1

Many of the last were thinkers, readers, and observers, who did their observing and some thinking while working in these channels, and their reading at night in their cabins. These same men have noted a great many facts and originated some of the most plausible theories concerning these ore deposits.

Some of the late writers on the subject have divided the time that has elapsed since the first streams of the Neocene period into several sub-divisions. While it is true that there were several flows of lava, with long intervals between, it seems unsatisfactory to divide into periods the time these streams were cutting their channels down through each sheet of lava and deeper into the bedrock each time, until the final flow that caused the streams to seek new channels along its marginal edges. The mere separation of the time into periods is not of practical importance to the miner or prospector.

During the time when the now extinct and lava-capped rivers were living streams, the eastern boundary of California was marked for a long distance by the lofty chain of the Sierra Nevada, the general trend of which was west of north and east of south. On the Pacific slope of these mountains there was a series of parallel low ridges and valleys of gradually decreasing altitude until the whole formed the eastern shore of a shallow sea, now occupied by the two great valleys of the Sacramento and San Joaquin. Descending this western slope at this time were a number of rivers cutting their way through these successive ridges, which were composed of mineral-bearing formations; these rivers concentrated and deposited the valuable minerals along their beds, while the debris was carried forward into the sea. After the streams had cut cañons of considerable depth extending far back into the mountains, there occurred a period of volcanic activity in the Sierras, and large quantities of lava flowed down the cañons, partly filling them. After this first lava, which was in most places a rhyolite mud, had ceased to flow, the streams began to cut through it, their beds being now much wider than they were before; consequently, there was not water enough to cover the entire surface and this resulted in the streams being diverted from one side to the other at many places, causing them to cut the new and deeper channels in the rims of the older beds at many points, leaving opposite these places portions of the latter with their covering of rhyolitic mud; this covering, having escaped subsequent erosion, is discovered by the miner ages afterward, being what he terms "the upper benches covered with pink lava." After a long period of quiescence, the volcanoes again became active, sending out a second flow of rhyolite mud, which filled the new channels many feet deep. During the inactivity following this flow, the streams

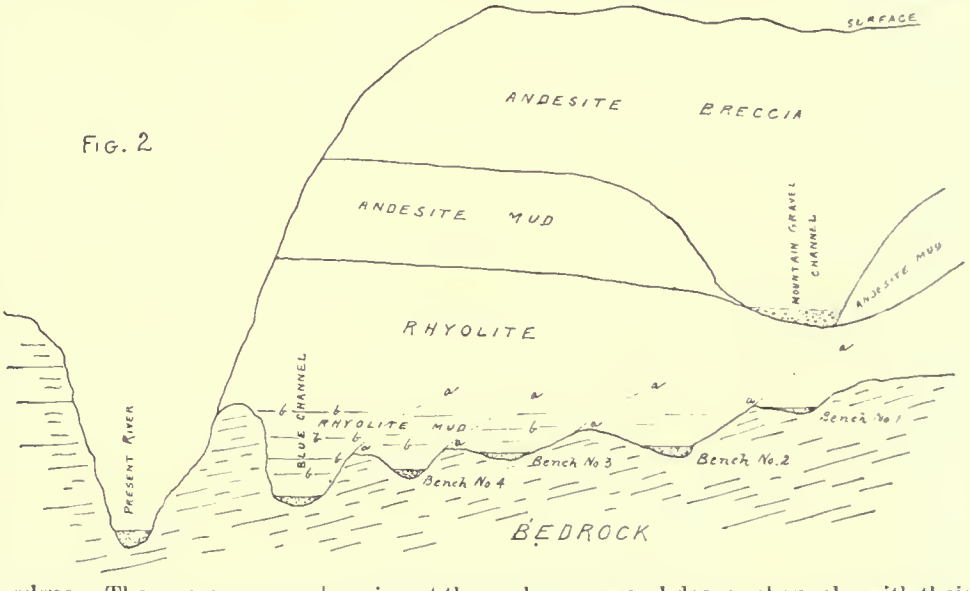


FIG. 2

again cut themselves new and deeper channels, with their resultant benches, as they did formerly, the benches of this period being lower than those of the first. That there were within the drainage-area of some of these streams four different lava flows, followed by the streams cutting themselves new and deeper channels before the 'deep' or 'blue channels' were formed, is proved by the existence of benches at four different elevations, as illustrated in Fig. 2.

The 'deep' or 'blue channels' are the latest of the lava-capped series, as they are cut deeper into the bedrock than the lower benches. The streams then had much

narrower beds than at any other period in their existence, as they cut into the bedrock several hundred feet in forming the blue channels. Then the volcanoes became active again, ejecting a somewhat different material from that of their former ejections. It became much harder on cooling, and on erosion it gave the boulders, cobbles, pebbles, and sand, which, with a smaller quantity of vein-quartz and bedrock-boulders, constitute the gravel of these deep channels, while the gravel of the benches consists entirely of smoothly washed boulders, cobbles, pebbles, and sand of white and blue quartz and some of the older bedrock series, but no lava except the overlying rhyolite mud.

That the area drained by these ancient rivers was sterile before the forming of the blue channels is evidenced by the absence of vegetable remains in the remaining portions of these stream beds known as benches. In the former there are large quantities of drift-wood, trees are found, also the decayed and charred remains of grasses that grew along their shores. Some of the trees and bogs are several feet in diameter, giving evidence that there was a long period of time between the flowing of the streams on the lowest benches and in the deep channels. During this time the volcanoes were in a state of rest, which was finally broken by a long and almost incessant period of activity, as indicated by the material now found, filling the cañons of these ancient rivers and their tributaries. The filling is generally lava of the last-mentioned character (rhyolite) reaching well up to the original surface of the older bedrock, with several strata of sand, water-worn pebbles of the same material, and quartz. On top of the last of the rhyolite-flows in many places, there was deposited a final flow of andesite mud (the miner's 'cement') many feet thick, which was of such a consistency that it formed an anticlinal, diverting the water of the tributaries to the marginal edges on the respective sides of the main streams. When the volcanoes had ceased their flow of andesite mud, these streams began to cut into the andesite along its edges, making new channels in which were deposited gravel and sand from the erosion of this andesite, forming the miner's 'mountain gravel.' While the streams were flowing in these later channels, there were several light flows of andesite mud and lava, which formed barriers to the cutting down process by diverting the streams toward the centre of the andesite plains, as it then appeared. Finally at some of the volcanoes, there was an eruption of a large quantity of mud and fragmental andesite; at others there was emitted basaltic lava, which flooded the larger part of the western slope of the Sierras, covering the whole area excepting the high bedrock peaks and hills. These enormous floods of andesite and basalt, at points high up in the mountains, diverted the streams to the north and south, and gave them a greater grade, which augmented their cutting powers for forming new channels. After a period of time that appears inconceivably long, we have the deep cañons and gulches of today, reaching deeper into the original bedrock than the Neocene deep channels.

If we could view all of the western slope of the Sierras drained by the streams that are tributary to the Sacramento and San Joaquin rivers, we would see those streams flowing in the bottoms of deep cañons, with steep and rugged sides terminating upward in high ridges; these ridges are lava-capped, and underneath them, in many places, are parts of the Neocene rivers that have escaped the sculpturing of the later channels.

It is my opinion that the deep channels, with their lava boulders, cobbles, and pebbles intermixed with some of quartz and bedrock, now overlaid with lava, are the later of the Neocene channels, and the age of the benches within the troughs of these channels accord with their elevation above the latter, that is, the higher above the deep channel the bench is, the older it is; further, that the benches are always void of gravel composed of the late lavas; that there is always a line of demarkation between the rhyolite mud overlying the gravel of the benches and the later lava-filling of the deep channels; and, finally, that benches may occur on either side of the deep channels and at any elevation above the bed of such channels. I venture to recommend the mapping of the workings in the deep channels, that their course may be ascertained, so as to guide the work of finding the lower benches, and if these are also mapped, then data will be obtained for exploratory work among the higher benches.

IQUITOS AND WESTERN PERU. — There is no rapid means of transportation between Iquitos and western Peru, and persons who travel between the two districts are obliged to make the trip by water, via Para, Brazil, which requires from two to three months, or to take one of several overland routes, which require from 30 to 60 days, according to delays experienced in obtaining mules, canoes, guides, etc., at the different stops along the journey. That there will before many years be communication by steamer and rail between these two parts of Peru there can be little doubt. In northern Peru an American company has obtained a concession for the construction of a railroad from the Pacific Coast to a point on the upper Maranon river to which navigation from Iquitos is possible.——In southern Peru the Government is at present actively engaged in surveys and preliminary preparations for a railroad from Oroya, a point on the Cerro de Pasco railway, to the navigable portion of the Ucayali river in eastern Peru. This road will be about 320 miles long, principally through a rough mountainous country, which presents many difficult engineering problems, all of which, however, it seems can be overcome. The work commencing at a point about 15 miles from Oroya, on the Cerro de Pasco railroad, and extending to a point on the Ucayali river, navigable the year round to the launches which ply out of Iquitos, has been divided into six sections and assigned to separate engineering parties. An American has charge of the first section of 100 miles, while German and Peruvian engineers have charge of the other sections. The party in charge of the work of the sixth section left Lima in April, 1906. They completed their work and arrived in Iquitos December 28; the engineer of which is also authority for the statement that, while there are several points that will require a vast expenditure of labor and capital to overcome, the entire route as proposed is feasible, and the construction of the road is practically assured; in fact, it is planned that active building operations will be commenced during the present year.

THE quality of the deposits of monazite sand now being worked in Brazil is not as good as it was formerly. It is not so rich in thorium and is more difficult to secure. So long as the tax on the sand remains at the former figure, and while the percentage of thorium is decreased, there is in fact an actual increase in the tax on thorium, the valuable constituent of the sand. Taking the Brazilian fields as a whole, this decrease of richness and corresponding increase of taxation has been considerable. Exporters of the sand say that they can do no business in the United States because the present tariff of six cents per pound is, at 5% of thorium, an actual tax of $1.20 per pound, and is practically prohibitive for them. The exports of the sand from Brazil in 1906 were 4,351,600 kilo. (kilo.=2.2 lb.), valued at $480,813, as compared with 4,437,290 kilo., valued at $485,184, in 1905.

Acid Flotation Processes at Broken Hill.

Written for the MINING AND SCIENTIFIC PRESS
By F. H. JACKSON.

The Broken Hill ore assays, on an average, 16% lead, 15% zinc, and 11 oz. silver. Until a few years ago, of these metals only 65% of the lead, and between 45 and 50% of the silver were saved, but of late, every year has brought an improvement, and it is claimed that by newly patented processes, a recovery of 80% of all the metals is possible, but at the present time roughly 75% of the lead, 70% of the zinc, and 60% of the silver are being extracted. In the meantime, dumps aggregating 6,000,000 tons, assaying 6% lead, 6.3 oz. silver, and 19.1% zinc, have accumulated.

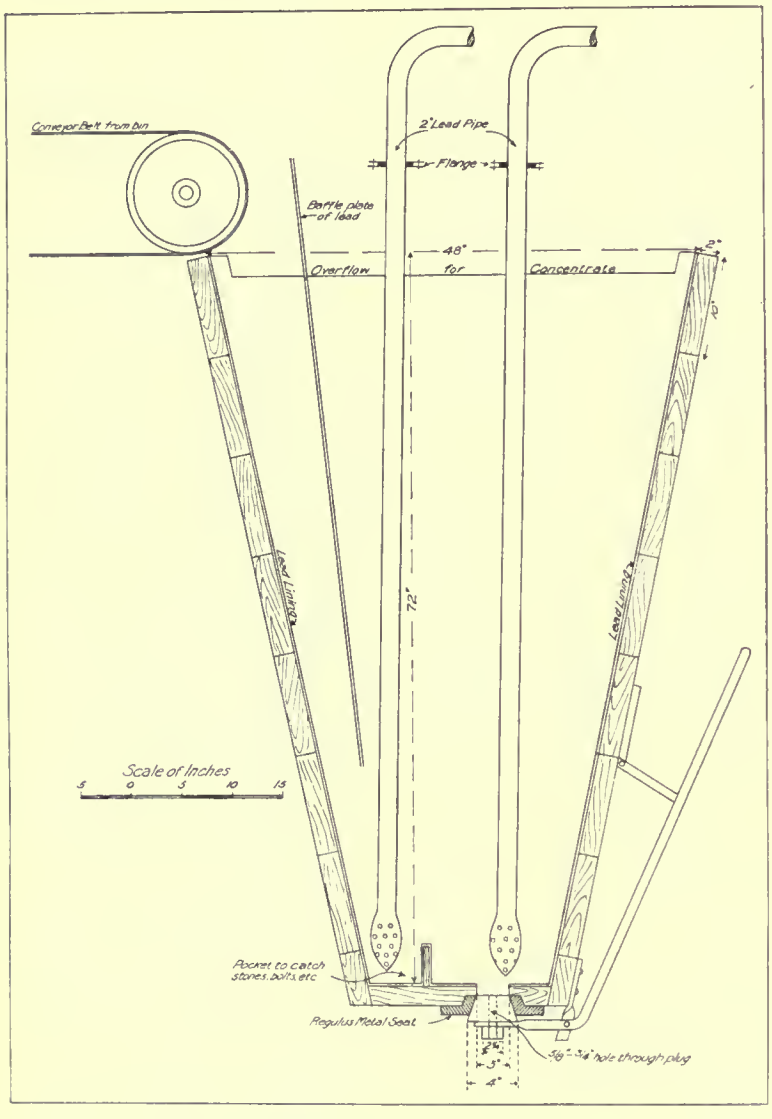


Fig. 1. Pan Used in Acid Flotation Process.

The ore consists of an intimate mixture of galena, blende, rhodonite, garnet, quartz, and calcite. The galena, of specific gravity 7.5, being practically lead sulphide, is easily separated by jigs, tables, and vanners, but the blende (sp. gr. 4) being of practically the same specific gravity as rhodonite and garnet, cannot be concentrated into a pure product by any method based on gravity, consequently the tailing from the lead concentrating mills consists of a mixed product of blende, garnet, quartz, rhodonite, and calcite. Moreover, the blende occurring in the Broken Hill lode is impure, carrying large amounts of isomorphous sulphides of iron and manganese, and will not assay more than about 52% zinc as against a theoretically pure blende of 67%, so that in concentrating the blende from the tailing it is difficult to obtain a product of more than 40 to 45% zinc.

Many processes, wet and dry, have been patented, whereby the blende may be separated from the gangue. The dry are chiefly magnetic processes, but as this paper only intends to deal with the acid flotation processes, a comparison of the different methods will not be attempted.

The Potter and Delprat patents are both for 'acid flotation' processes and both depend on the power of an acid solution to float the particles of zinc-blende on its surface, from which they may be mechanically and continuously drawn off. Both processes are practically the same, and the same type of plant required for each, but while a weak acid solution is all that is required in Potter's method, the Delprat process requires the use of salt cake, which, it is claimed, increases the specific gravity of the solution and therefore its floating powers. This salt cake is acid sodium sulphate ($NaHSO_4$) and is a by-product in the manufacture of sulphuric acid at the Proprietary Company's works. Whether it is of any material benefit is doubtful, as the specific gravity of the solution is in any case greatly increased by the amount of sulphates in solution. Both processes use sulphuric acid simply on account of its relative cheapness. The Potter process was the first in the field, and the company controlling the nt has become involved in an action against the Broken Hill Proprietary Co. using the Delprat process, alleging that the latter is a violation of patent rights.

The strength of the acid solution used depends on its heat, and on the alkalinity and freshness of the tailing treated; it varies from 0.5 to 1.5% H_2SO_4. Very old tailing, and that which has become oxidized, consumes more acid than would be required to treat it as it came from the lead concentrators, in dissolving the incrustations from the faces of the blende particles before concentration by flotation can take place. The heat of the solution is a most important factor; it should be kept as high as possible, and not lower than 80° C. Testing of solution in the pans for heat and acidity should be frequent throughout the shift, the latter being tested by titration with normal sodium hydrate, using methyl orange as an indicator. Material between a 40-mesh and an 80-mesh screen was found to be the best in size for treatment, and old tailing should be sifted through coarse screens to extract stones and other rubbish, which cause trouble in the pans. In any case, a division is made at the bottom of the pan to prevent this rubbish from blocking the plug-hole (Fig. 1). What actually happens in the pans is a little obscure, but the following is an approximation. The calcite and other carbonate particles in the tailing, together with the iron in the blende, are at once attacked by the acid, and bubbles of CO_2 and H_2S are respectively formed. For some reason, the bubbles of CO_2 leave the calcite, etc., and attach themselves to the bubbles of H_2S surrounding the particles of blende, thereby causing these to float to the surface of the liquor; the flow of liquor carries the blende and bubbles into boxes, where, on the bursting of the bubbles, the blende particles sink and are drawn off. The quartz, rhodonite,

etc., in the gangue sink to the bottom of the pan without hindrance and are tapped, the process being continuous.

The following is the practice in the Block 14 mill, at Broken Hill, using the Potter process: Acid of about 90% H_2SO_4 was bought by the ton, and stored in a lead-lined square wooden vat about 10 by 10 by 8 ft., securely braced by iron rods on the outside. From here it was run by a two-inch leaden pipe into the solution vats as required to keep the solution up to the right strength. These pipes should be under cover or protected in some way in cold weather owing to the pure acid freezing at a comparatively high temperature. The solution vats were also square lead-lined wooden vats about 12 by 12 by 12 ft. Round vats would have been better owing to the tendency of the lead lining to split at the angles in the square vats, thus causing leakage and considerable damage. Steam jets were introduced to keep the solution at boiling point, 80 lb. pressure being used, but of course superheated steam would have been cheaper. The solution ran from these vats to the treatment-pans, the flow being controlled by regulus metal valves. Trouble was caused by chips of wood and other floatable rubbish being pumped up with the solution at the tail end of the mill into the storage vats and choking them. Screens were tried over the openings of the pipes inside the vats, but the various sulphates in solution formed a white incrustation and choked them rapidly. On the occasions mentioned, a mat, attached to a length of copper wire, had to be lowered into the vat to cover the pipe-opening, the valve taken off, both it and the pipe cleared, and replaced. Two pipes ran to each pan and were interchangeable from vat to vat. The last seven or eight feet were separate lengths of pipe, closed at the end, but bulged and punctured round the bottom to give free passage of the solution into the pan. These lengths had to be removed on an average once each shift to clean out the chips blocking the holes.

The treatment pans (Fig. 1) were lead-lined pyramidal boxes, 6 ft. deep inside, 4 by 4 ft. at the top and about 18 by 8 in. at the bottom, constructed of 2 by 10 in. oregon pine, and braced with iron rods from side to side on the outside. A seat was bolted on the bottom of the pan, in which a plug was fitted operated by a lever to let out stones, etc., blocking the opening. These seats and plugs were cast at the mine from regulus metal (90% Pb and 10% Sb). The life of a plug was about 48 hours, the original ⅝-in. hole being worn to about 1¼ in. during that time; it was then replaced by a new one, and used to re-cast others. The material treated, consisting of old buddle-tailing, was fed into the pans by conveyor-belts. A baffle-plate of lead was fitted into each pan and extended half-way down, so that the feed had to pass almost to the bottom of the pan before the zinc could rise on the other side. In this way, only slime in suspension in the solution overflowed with the blende. Two pans were used, and each averaged eight tons per hour for several months. The solution flowing in through the openings in the pipes at the bottom of the pans had to be of such an amount as to keep a good overflow, while continuously discharging the tailing through the plug at the bottom. A hopper with an overflow launder caught the tailing, from which it was tapped into trucks (See Fig. 2). The trucks were a continual source of trouble owing to the acid attacking all the ironwork, bolts, wheel-flanges, rails, etc., and better results have been obtained by discharging the tailing with as little moisture as possible onto a conveyor-belt and draining it into a sump. The overflow from the pans carrying the blende, ran down lead-lined V-shaped launders into a hopper, plugged at the bottom like the pans, and giving a continuous discharge of blende into the trucks below. A small amount of slime got away with the blende at this stage, but in later practice a cone-separator was introduced below the zinc-box, from which the blende was discharged into trucks as before, and the slime overflowed to Wilfley tables to extract any blende remaining in it. The overflow from the zinc-box carried away most of the slime, which was caught in a long settling-box, and afterward treated on a Wilfley table. A centrifugal pump, running submerged, raised the solution from the last compartment of the settler back to the first solution-vat. This first vat settled any slime

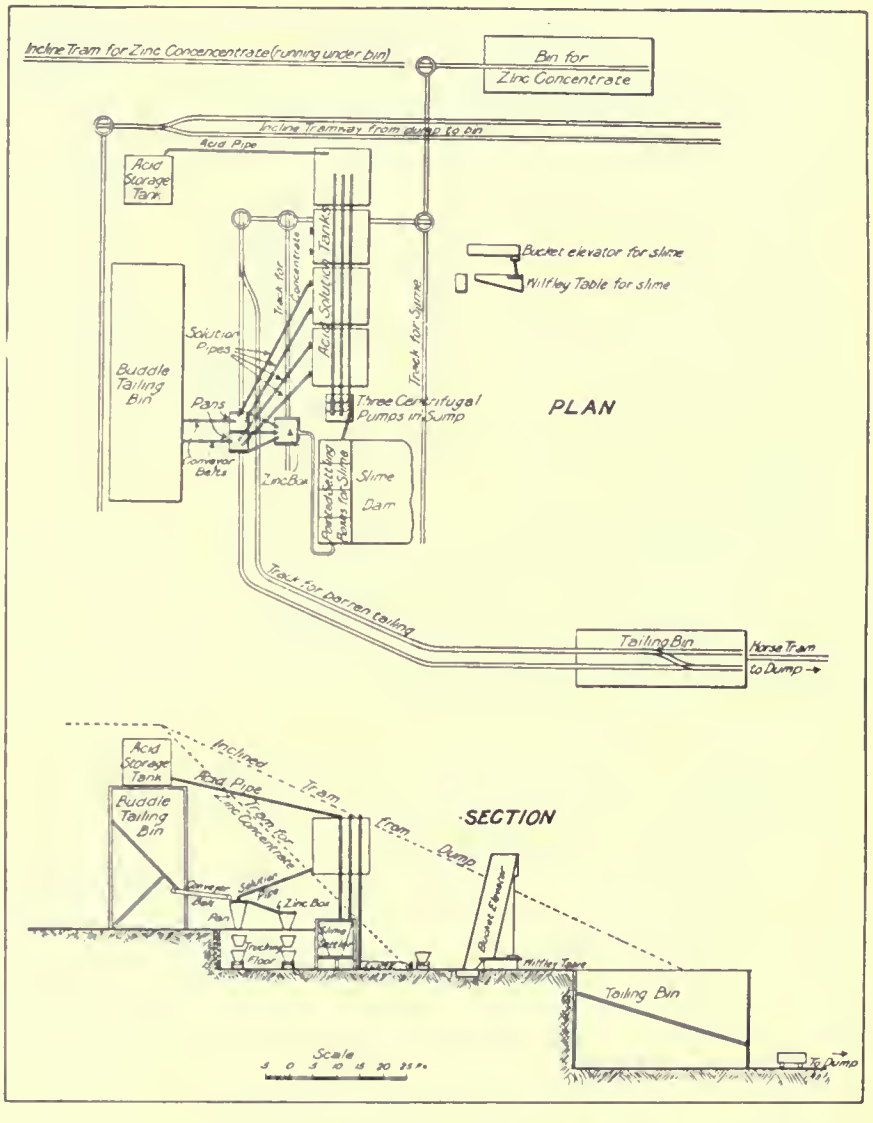


Fig. 2. Plan and Section of Tailing Mill.

remaining in the solution and was never connected to the pans. The pumps were designed and cast at the mine from regulus metal and worked very well when running submerged, but required packing often to avoid leakage of acid on the spindle. Trouble was experienced with those running as suction-pumps owing to the continual leakage of air caused by the acid attacking the bolts, and the difficulty of keeping an air-discharge pipe screwed firmly enough into the regulus metal. Moreover, the slime settled in the sump stiff and hard, and when enough was in to reach up to the valve of the suction-pipe, the pump, of course, would not draw. This latter difficulty was overcome by making the suction-pipe of rubber hose, reinforced by copper wire, and a length of copper wire fastened to the valve at the end enabled it to be drawn up clear of the caked slime, and when not in use, clear of the solution. The pumps required constant attention and an air-lift has been found to give much better results.

The following figures, relating to extraction and costs, represent an average for six months. The buddle material assayed 5.8% Pb, 15.6% Zn, and 6.6 oz. Ag, and from these a concentrate assaying 6.1% Pb, 42% Zn, and 11.3 oz. Ag was made, about one ton of concentrate being produced from four tons of tailing treated. The recovery was about 25% of the lead, 67% of the zinc, and 42% of the silver. Costs were 9s. 8d. per ton of crude tailing, or about 40s. per ton of concentrate produced, divided as follows:

	s.	d.		s.	d.
Acid	3	3	Coal	1	0
Labor, office, and managem't	3	5	Stores		3
Dump contract	1	3			
Water		6		9	8

These costs could be reduced in almost every particular. For instance:

Acid. By being obtained at a lower price than £11 per ton, the consumption was about 30 lb. per ton of tailing treated.

Water. Lower price; 5s. per 1,000 gal. being the price at Broken Hill.

Coal. By the use of superheated steam.

Dump Contract. High price owing to the fact that the buddle tailing had to be shoveled into trucks at the dump, and hauled up an inclined tramway to the bins. This contract also included the loading of the concentrate into trucks underneath the bins, and hauling it up a similar tramway. Conveyor-belts could be used to do this work at one-third the price.

Labor. Expensive owing to trucking. The tailing (barren) was handled twice, first, in trucking to the bin, and second, in shoveling it from the bin to other trucks in which it was taken by horse-traction to the dump.

Except for the trucking only a couple of men were required, one to attend to the pans, and the other to the pumps, shafting, motor, etc. Provided everything went well, the process was continuous and became one of the simplest methods of concentration. Better arrangements could undoubtedly have been made, but the plant started in an experimental fashion, being continually altered, and evolved out of the more primitive methods of treatment; the best had to be made of what there was, the only remedy being, of course, the building of another plant.

THE London *Commercial Intelligence* states that outside of Canada and the United Kingdom, there are no steel works of considerable size in the British Empire. Big works are proposed for India, South Africa, and New Zealand. In Australia works are being constructed in New South Wales, 101 miles from Sydney, where unlimited quantities of iron and coal exist. The capital of the new company is placed at $2,000,000.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The lessee of a mine has no title to any specific portion thereof, until mineral of the kind described in the lease is actually produced and severed, so that it becomes personal property. The legal title to, and the possession of, the entire mass and volume remain in the owner of the strata in which it is confined until so severed.

Kansas Nat. Gas Co. *v.* Board of Commrs., (Kans.) 89 Pac. 750. (March, '07.)

There can be no taxation of separately owned mineral rights, except when the right or title to minerals in place has been severed from the right or title to the remainder of the land, and has become vested in a person other than the one having the right or title to the remainder of such land. When the statute applies, the right or title to minerals is taxed as realty.

Kansas Nat. Gas Co. *v.* Board of Commrs., (Kans.) 89 Pac. 750. (March, '07.)

Where the mine-boss, the blacksmith, and two miners occasionally rode in a car used for hoisting ore; and where the mine-boss directed miners not to use the car; and where the mine was equipped with a system of ladders, well lighted, kept in good order, and commonly used by the employees in going to and from the mine, it was held that such car was not an appliance furnished by the master to be used as a passenger-elevator.

Burns *v.* Old Sterling Co. (N. Y.), 80 N. E. 927. (April, '07.)

The lessee of a gas and oil lease failed to drill a well within the time stipulated, and the lessor served notice on the lessee that he would not accept any renewal, and demanded that the work be begun and pushed to completion. On failure of the lessee to comply with the lease by drilling wells as required by its terms, the lessor was entitled to a cancellation of the lease.

Puritan Oil Co. *v.* Myers (Ind.), 80 N. E. 851 (April, '07.)

In an action against an adjoining land owner for damages for taking coal from the plaintiff's land, it was agreed that the defendant should take coal from under the plaintiff's land, and give a bond to account therefor in case the plaintiff succeeded in his action. On the trial of the case the boundary was determined in favor of the plaintiff, and it was held under the bond and the agreement that the defendant was only liable to the plaintiff for a reasonable royalty on the amount of coal removed.

Sandy River Coal Co. *v.* Whitehouse Coal Co. (Ky.), 101 S. W. 319. (April, '07.)

In an action for damages for unlawfully working a mine and taking coal or ore therefrom, the rule is that if the taking was not a wilful trespass, but was the result of an honest mistake as to the true ownership of the mine, the measure of damages is the value of the coal or ore as it was in the mine before it was mined.

Sandy River Coal Co. *v.* Whitehouse Coal Co. (Ky.), 101 S. W. 319. (April, '07.)

An injunction may be granted to prevent a threatened assault to a claimant and his employees, in case they appeared upon or undertook to do any work upon a claim, pending an action to determine the right of possession and ownership of certain mining ground. Such injunction may prevent the defendant, his agents and employees, from in any manner interfering with the plaintiff and his employees, in performing necessary discovery work and other work upon such claim necessary to hold the same, although all the allegations of the plaintiff's complaint were denied by the defendant.

Safford *v.* Fleming, (Idaho) 89 Pac. 827. (April, '07.)

Gold Tellurides.

Written for the MINING AND SCIENTIFIC PRESS
By W. J. SHARWOOD.

Attention was recently called, in the editorial columns of this journal, to the occurrence of tellurium with the gold ores of Goldfield, Nevada. The accompanying drawings of thin sections show two modes of occurrence of these ores, and form a supplement to the illustrations given in the issue of January 26. With them are included two others of gold-telluride ores from Kalgoorlie, Western Australia. The black areas indicate dense metallic gold.

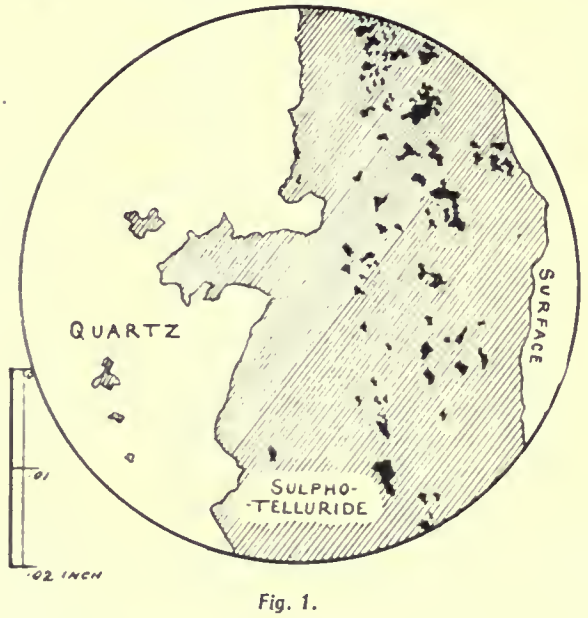


Fig. 1.

Fig. 1. A small specimen, said to come from the Mohawk mine, consisted of a mass of quartz or silicified porphyry, containing some fine scattered particles of pyrite and telluride, and having one face covered with a thin layer of a black mineral. This black material gave strong reactions for sulphur, tellurium, copper, and iron, also for arsenic, antimony, gold, and silver (about 6% and 1%, respectively, of the two last)—a composition agreeing with the admixture of tetrahedrite and telluride suggested in the editorial referred to. To all outward appearance, however, the material seems to be uniform in character, and gives no evidence of being such a mixture. A section was cut across the black layer, which did not exceed 0.05 in. thick, and is shown, highly magnified, in Fig. 1. Free gold is seen lying in the mass, in small and irregularly shaped particles, which show a tendency to arrange themselves in layers parallel to the surface. The gold is between 850 and 900 fine. The assays quoted by Lochiel King of the famous shipment of Mohawk ore indicate a fineness of about 890, if the total gold and silver in the ore are considered.*

Fig. 2. A second specimen of silicified porphyry from the Goldfield district had a brown streak, half an inch wide, running across it. On close examination, the color was found to be due to very fine particles of gold, thickly strewn through the rock, and forming 5 to 10% of the bulk, and one-quarter to one-third of the weight, of the brown portion. This gold was very dense, becoming brilliant when cut or ground down, and was of remarkable purity, being over 996 fine, or worth $20.60 per ounce. In certain patches a telluride occurs in irregular particles like the gold, or mixed with it. There was too little to allow of an analysis, but in appearance it resembles sylvanite.

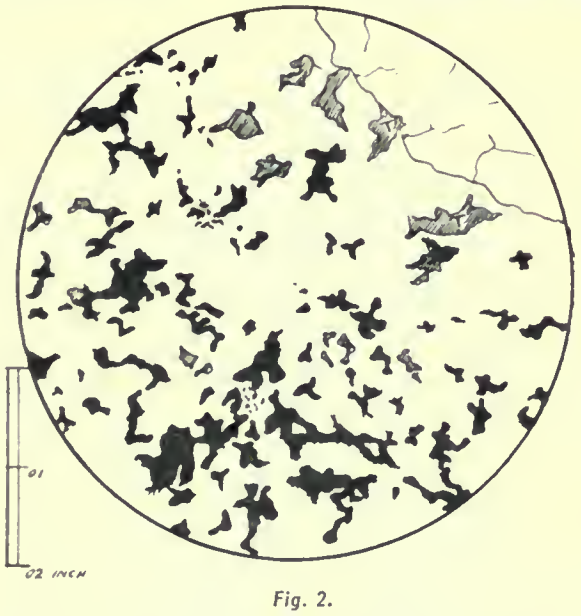


Fig. 2.

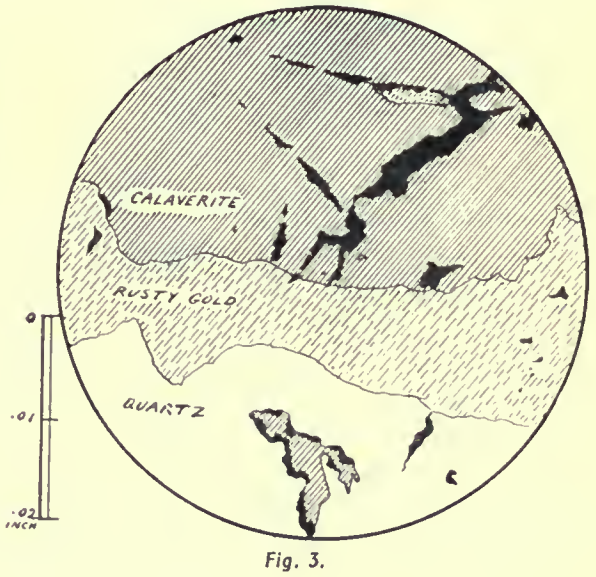


Fig. 3.

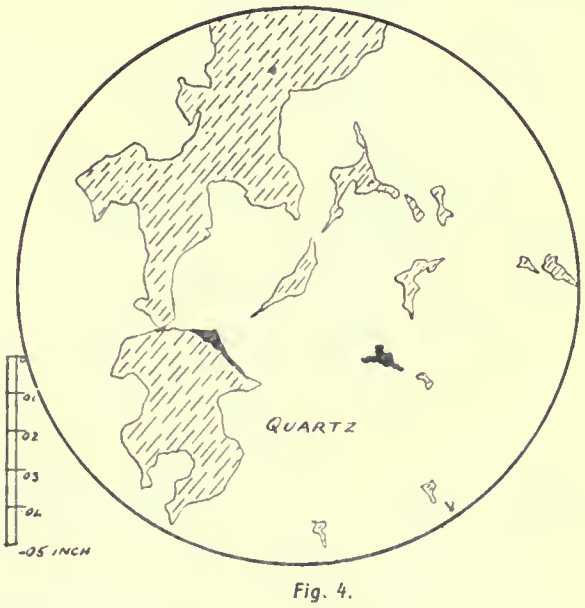


Fig. 4.

Fig. 3 and 4. In contrast with the preceding are two sections of telluride ore occurring with quartz in a greenish schist from Kalgoorlie. The calaverite, of which Fig. 3 is a section, was in rather large masses, and

*MINING AND SCIENTIFIC PRESS, February 23, 1907.

appeared bright and fresh. Under the microscope it showed fine streaks of brilliant yellow gold, many of them in straight lines, and at the border was a dull yellow or brownish band, which proved to be due to finely divided gold in a spongy, soft, and almost earthy condition, but which became bright when burnished by rubbing or annealed by heat. It was like mustard-gold, and could only be amalgamated with great difficulty. It had evidently been liberated by oxidation of the telluride, but without uniting into the dense brilliant form usual in vein gold. Fig. 4 shows a similar specimen, in which the telluride has entirely disappeared, and masses of spongy and rusty gold remain.

The Geology of Japan.

By Robert Anderson.

*The ground-plan of the Japanese islands was laid during the earliest geological times, Archean gneisses and schists and a great thickness of Paleozoic sedimentary, metamorphic, and igneous rocks being the basement complex. Mesozoic, Tertiary, and Quaternary formations are wide-spread and diversified, having the character of a superstructure over an older land mass. The island chain is continental in character, not chiefly of volcanic origin, although volcanic activity has always been a feature of its history. It is a country of long-continued and great geological activity, as shown by the variety of its rocks, by the presence of a thick column of strata representing the earliest and latest as well as intermediate times, by the metamorphism and excessive disturbance of these strata as the result of repeated movements, by the presence of many igneous intrusions and volcanic remains which show that similar igneous forces as are at work today have always been active, and by the modern land-movements forming depressed broken shore-lines and terraces and keeping a fairly new face on the topography of areas occupied by the oldest rocks, these movements being illustrated in the every-day earthquakes to which Japan is subjected.

In a number of points a similarity exists between the geology of Japan and that of the western coast of America: In the existence in both California and Japan of a somewhat similar thick basement complex; our Franciscan is probably Jurassic in age; the Japanese terrane with which it might be compared is supposedly Paleozoic; both formations are intruded by similar serpentine of Jurassic or Cretaceous age. In the apparent Mesozoic age of the wide-spread and important intrusions of granite. In the similarity of the old and recent faunas and floras, as has been partially brought out by a few paleontologists. In the presence in both countries of a large amount of schist formed of the blue amphibole glaucophane, whereas it is rare in all but a few places elsewhere. In the fact that both countries have been long coastal belts of volcanic activity during Tertiary and Quaternary times, the thickness and wide extent attained by the Tertiary tuffs in Japan being remarkable. In the recency of earth movements, as shown in the multitude of earthquakes, the presence of upraised Quaternary deposits and marine terraces, and by the evidence of present oscillations in the level of the coasts. And the resemblance holds good particularly in the tremendous land-building activity of the Tertiary on both sides of the Pacific, contributed to by tectonic movements and the rapid denudation of land-areas and deposition along narrow belts. This feature is illustrated by the great thickness of the Tertiary formations, their structural disturbance, and their lithologic alteration.

*Abstract of paper read before the Geological Society of Washington. *Science*, May 24, 1907.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

A. B. G., of Oracle, Ariz., sent a fragment of Ilmenite.

A piece of tin, or Cassiterite, was sent by T. L. L., Idaho.

A bit of Barite was sent from Hammil Station, Cal., by F. C.

The Zinc mineral sent from Scranton, Utah, by R. F. B., is Calamine.

A piece of specular Hematite was sent from Sulphur Springs, Colo., by G. H. H.

A piece of Quartz carrying pink Tourmaline was sent by C. L. B., of Temecula, California.

The minerals sent by C. F., of Dayton, Nev., are black specular Hematite and bluish green Opal.

J. R. R. sends from Tres Piedras, New Mexico; No. 1, metamorphosed Conglomerate; No. 2, black Quartzite; No. 3, Rhyolite; No. 4, Rhyolite.

D. T., of Iron Springs, Idaho, sends: No. 1, Limonite; No. 2, Quartz and Pyrite in an altered rock; No. 3, Andesite; No. 4, Epidote and Quartz.

The specimens sent by A. E. P., of Lucin, Utah, are: No. 1, brown iron-stained Calcite, with a black mixture of Calcite and Clay Gouge; No. 2, Calcite, Limonite, and Quartz; No. 3, Schist.

The black sand sent from Sacramento, Cal., by B. W., contains Magnetite, Ilmenite, Zircon, Quartz, Garnet, etc., with a little Copper, Gold, and Platinum. The other specimen is Quartz.

The specimens marked A. B. C., New Mexico, are: No. 1, Andesite; No. 2, Limestone; No. 3, Quartzite; No. 4, Specularite, Limonite, Quartz, and Calcite; No. 5, Clay Shale; No. 6, Limestone.

The specimens sent by B. N. S., from Stevens county, Washington, are: No. 1, Andesite; No. 2, Andesite; No. 3, Andesite; No. 4, quartzitic Breccia, cemented by Calcite; No. 5, Quartz, Calcite, Chlorite, etc., and probably an altered Andesite; No. 6, Chert.

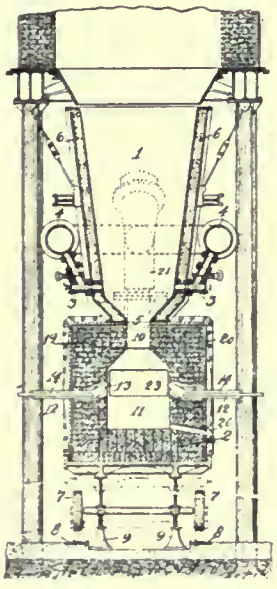
S. O., of Windham, Alaska, sends: No. 1, Schist with Sulphides, and may carry Gold or Silver; No. 2, Mica Schist; No. 3, dolomitic Limestone; No. 4, Hornblende Schist; No. 5, Hornblende and Chlorite; No. 6, Pegmatite Granite; No. 7, Quartzite; No. 8, Mica Schist.

Iron and Steel Industry in Australia.—From Melbourne comes the report of the formation of two companies, one with a capital of over $2,500,000, for the manufacture of iron and steel in Australia. One company is to operate at Lithgow, in the State of New South Wales, where large deposits of magnetic, hematite, and other iron ores, together with coal and limestone, are said to exist; the other is to be located near Melbourne, the ore being brought from the Tamar river, Tasmania. In both cases large plants are to be erected. These companies are the first serious attempts to establish the iron industry in Australia, though the local manufacture of at least sufficient iron and steel for the requirements of the Commonwealth has long been advocated by those interested in the subject.

MINING AND METALLURGICAL PATENTS.

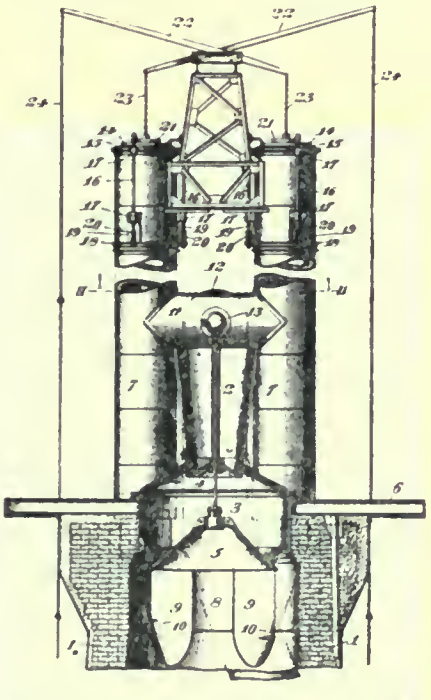
Specially reported for the MINING AND SCIENTIFIC PRESS.

SMELTING-FURNACE.—No. 852,613; Walter G. Perkins, San Francisco, California.



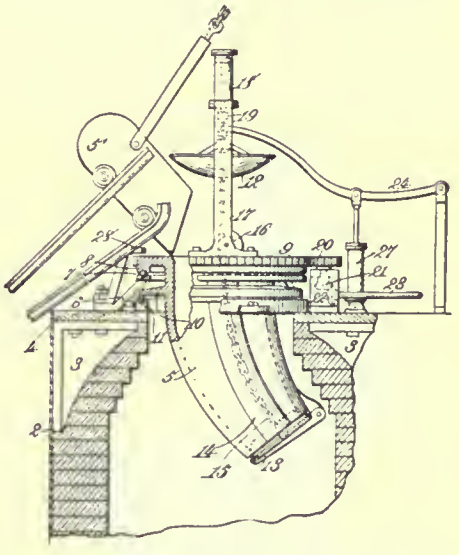
In a smelting furnace a hollow structure formed in two sections, the lower end of the upper section being contracted and provided with an opening, and the lower section being provided with a chamber which communicates with said opening, means for introducing a blast of air into the upper section above the contracted portion, means for connecting said air introducing means with the chamber of the lower section and means for introducing an inflammable gas into the chamber of the lower section.

BLAST-FURNACE TOP.—No. 851,128; John W. Gocher, Johnstown, Pennsylvania.



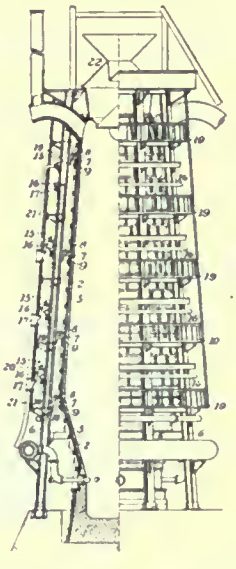
In a blast-furnace the combination with the stack, of an explosion-chamber of large diameter to thereby maintain low gas-velocity therein; located substantially in line with the wall at one side thereof and extending vertically far above the same, a charging-hopper, a port below said hopper having a steeply-inclined bottom connecting said chamber with the interior of said stack and a down-comer connected with said chamber intermediate of its ends and at a point a considerable distance above the top of said stack.

BLAST-FURNACE-CHARGING APPARATUS.—No. 853,016; Guy R. Johnson, Clarksville, Tennessee.



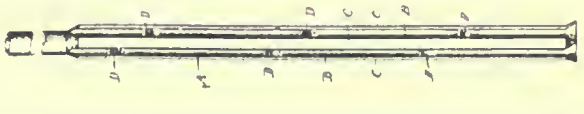
The combination of a blast furnace, a revoluble spout extending into said blast furnace, a valve hinged to the lower end of the spout, chains connected with the valve, pipes carried by the spout through which said chains extend, means for operating the chains in a direction to close said valve to cause it to support a mass in the spout, said valve when opened serving to release said mass, and a second valve supported independently of the spout and closable against the upper end thereof above the mass therein and to constitute a seal for said spout.

STACK-FURNACE CONSTRUCTION.—No. 853,698; Joseph L. Hunter, Roanoke, Virginia.



A stack-furnace of varying cross-sectional areas at different levels having above the mantle a metallic jacket composed of annular sections, and exterior structural framework around the furnace supporting some of said sections.

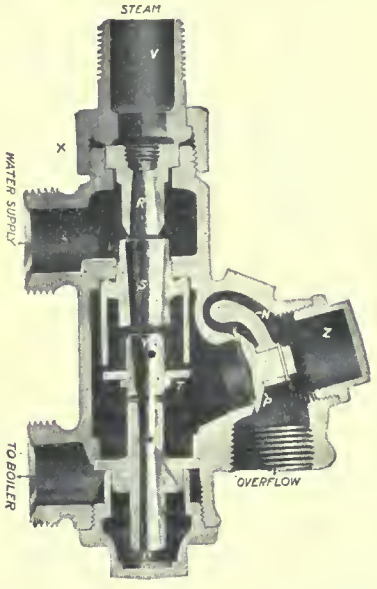
ROCK-DRILL.—No. 847,587; Bradford H. Locke, New York, New York.



A rock-drill having a longitudinal channel and a series of lateral openings therefrom at frequent intervals along its length back of the drill-head, whereby the drill can be successively sharpened without closing the openings other than that next the head.

Penberthy Automatic Injector.

The Penberthy Automatic Injector is a perfect re-starting automatic machine. By this is meant that when the injector is working, if the current of water be suddenly interrupted, as is liable to happen from a sudden jar or jolt (on such apparatus as traction engines or road rollers or in

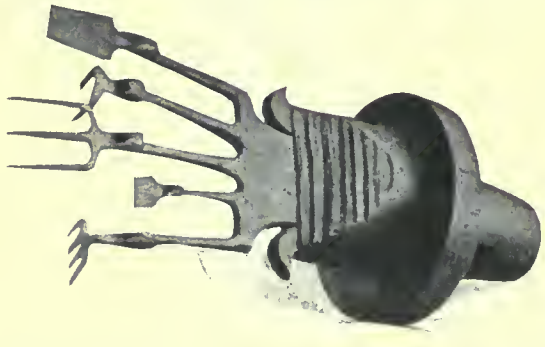


case of a marine boiler by the rolling of the vessel) this injector will automatically re-establish the current without attention from the attendant. The Penberthy is so constructed as to have but few wearing parts and will last for years with proper care without renewals. All parts are interchangeable, however, when required.

The Penberthy Injector Co., of Detroit, Michigan, are pioneers and the largest manufacturers of automatic injectors in the world.

Commercial Paragraphs.

THE ARTHUR KOPPEL CO. is distributing an attractively illustrated booklet descriptive of the Arthur Koppel Forged Steel Shoes and Dies. As a proof of the excellence of the steel produced in making these shoes and dies the company



exhibits an illustration, herewith reproduced, of a shoe, the body of which has been forged into miniature tools. From this special forged steel the Koppel Co. also makes all accessories for shoes and dies, cams, tappets, bore-heads, roll-shells, crusher-plates, rollers and forged rings for the Huntington mills, base and cast-ring tools for the Chilean mills.

A. L. TAYLOR COMPANY announce that they have succeeded to the business of the late Seymour R. Church, who died a year ago. The plates and copies of his book, 'Analysis of Pig Iron,' were destroyed in the great fire, therefore it is no longer possible to supply orders for this valuable work. The Taylor Company is prepared to answer such enquiries as were formerly sent to S. R. Church; they should be addressed to them at 9 California St., San Francisco.

THE LUNKENHEIMER COMPANY, Cincinnati, Ohio, has established its Eastern office and warehouse in much more commodious quarters, in the building at 66 Fulton St., New York, recently erected. Some conception of the comprehensive stock carried at this depot is afforded by a mention of some of the principal classes of goods made by this company. There are valves for steam, water, gas, and oil; lubricating devices, for ordinary gravity and pressure systems, including cylinder and bearing lubrication, and a complete stock of grease-cups and mechanical lubricators, for auto and high-power motor-boats; likewise a comprehensive line of specially designed cocks and fittings for gasoline piping. In valves there is a stock of bronze goods for high-pressure marine service as large as 8-in. diam. up to 300 lb. per sq. in. There is also a complete line of lubricating devices for gas-engines and air-compressors.

Trade Treatises.

CRANE CO., Chicago, Ill., issues a pamphlet on valves, fittings, and appliances.

MINNEAPOLIS STEEL & MACHINERY CO., Minneapolis, Minn., Brochure No. 101, on the Twin City Corliss Engine.

THE SULLIVAN MACHINERY CO. is sending out a fine 112-page catalogue entitled 'Modern Practice in Air Compression.'

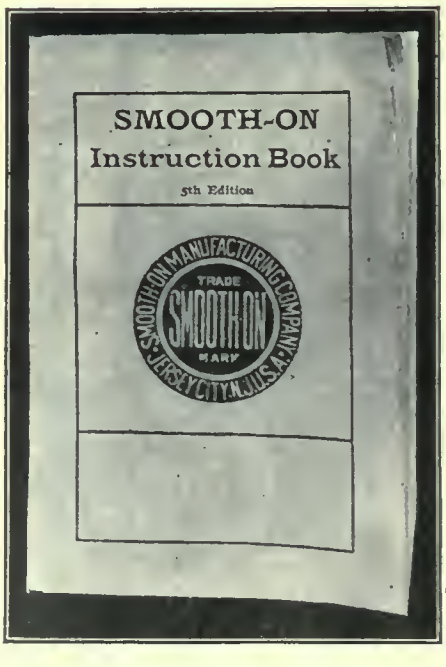
ALLIS-CHALMERS CO., of Milwaukee, Wis., has issued Instruction Book No. 5,009, for the installation and operation of direct-current motors and generators, type K.

CHROME STEEL WORKS, of Chrome, New Jersey, has issued a little pamphlet on 'Chrome Steel Wearing Parts for Cement Grinding Mills.' The Pacific Coast representative is George W. Meyers, Box 135, Berkeley, California.

THE FORT WAYNE ELECTRIC WORKS, of Fort Wayne, Indiana, is sending out Bulletin No. 1,086 on Direct-Current Series Enclosed Arc Lamps; No. 1,091, on Direct-Current Motors; No. 1,092, on Single-Phase Motors; and No. 1,093, on Small Power Motors.

THE JEFFREY MFG. CO., of Columbus, Ohio, has mailed us Jeffrey Bulletin No. 12, a very attractive 80-page publication on 'The Care of Electric Mine Locomotives in Service,' designed to place before the users general instructions for the care and operation, with a description of the equipment, of electric locomotives.

THE SMOOTH-ON COMPANY recently issued the second edition of their No. 5 Instruction Book. This book tells a



few of the many ways in which the different Smooth-On specialties have been used and the results obtained. It is an interesting book and valuable to all manufacturing concerns, especially users of steam. The book will be sent free to anyone sending their name and business address to the company, at Jersey City, New Jersey.

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Editorial.

THE NEXT MEETING of the American Institute of Mining Engineers will be held at Toronto, on July 23. A visit will be made to Cobalt, to Sudbury, and to some of the neighboring mining camps.

OUR ENGLISH FRIENDS have good reason to protest against the insufficient postage paid on letters from America. We publish such a protest from Hooper & Speak, a firm of mining engineers not unknown on this side. Owing to the two-cent rate prevailing all over this continent, that is, in Canada and Mexico, as well as the United States, most of us are apt occasionally to forget the higher rate demanded on letters to Europe. We bespeak more care in this matter.

A MOVEMENT is on foot to build a great national gallery of fine arts at Washington and to demand the creation of a department of fine arts, with a Cabinet minister at the head of it. This will arouse some feeling among those that clamor for a Minister of Mines, with a department to represent that industry. Is the first a sly scheme to ridicule the second? Shall we hear next of the need for a department of fishery, with an expert fisherman at the head of it, who shall be a member of the President's cabinet?

FROM A FRIEND at Butte we learn that the wonderful ore in the Receiver mine that was to confound all books on mineralogy is native copper in gouge. It is evidently the result of secondary enrichment, as is also the chalcocite that gives value to the occasional shipments made from that mine. It is a relief to learn that no new mineral carrying 95% copper has been found, for we have a kindly feeling for mineralogists. Native copper will prove just as profitable, and less confounding.

ELY promises to be one of the great copper-producing districts of the world, therefore the article by Mr. James W. Abbott will prove timely. No district better demonstrates the basic principles of mining engineering, the importance of immense deposits of low-grade ore, and the stimulus given by a high metal market. The use of the steam-shovel is a new feature in copper mining and, as at Bingham, it promises to be of great service to Ely. The occurrence of rich mineral in the deeper workings affords evidence of orebodies of extraordinary dimensions and the metallurgical treatment is likely to present many points of interest to the profession.

TIN ORE is so scarce in America, that the discovery near Spokane, described in our issue of May 25, is of particular interest. We learn that a shaft has been sunk 30 feet, exposing a vein 4 to 5 feet wide. The ore assays about 15 per cent, which is high. The impression

is that the deposit will not prove persistent, although 'float' can be found all over Silver hill. There is some scheelite, the tungstate of lime, associated with the cassiterite, and this would render ore-dressing difficult. The latest information concerning this discovery will be found under 'General Mining News.'

ACCORDING to our Butte correspondent some of the larger mines in that important copper district have adopted the policy of extracting the poorer grade of ore while the price of the metal is high, reserving the first-class ore for a rainy day, that is, when copper brings a lower price on the market. This is probably true and indicates an excellent conservatism, but we fear that similar statements will be made by less responsible parties in order to hide the real poverty of some of the copper mines, and to create ideas of valuable reserves that may prove fictitious. Sauce for the goose is not always sauce for the gander, and statements made by the promoters of holes in the ground, must not be accepted as gospel because they resemble those emanating from the Anaconda management. It is too much like the stories of young mines that are expected to pay handsomely because they contain ore like the Homestake or the Alaska-Treadwell, without any evidence that they have the tonnage necessary for an enterprise of similar magnitude.

The Trial at Boise.

THE story of events that are a disgrace to the States of Idaho and Colorado, and a foul blot on popular government in America, has been revived by the sensational accounts of the trial now proceeding at Boise City. Whether William D. Haywood and the other officials of the Western Federation of Miners are guilty, the jury will decide. As regards the testimony of the informer Orchard, there is much that may be said, for it throws a lurid light on many facts previously known to those of us who have been in touch with local conditions in the Cœur d'Alene, in the Telluride district, and at Cripple Creek. The assassination of Arthur L. Collins and the attempt on the life of F. W. Bradley give, to many readers of this journal, a personal interest in the labor disturbances under review. But it means much more than that, for the tragic events have afforded a depressing example of the utter failure of popular government to stamp out lawlessness promptly. It is true that in other countries, such as Turkey and Russia, deeds equally atrocious have been done, even recently, not only despite the Government but often with the connivance of its officials, so that in regretting the inefficiency of popular government in curbing anarchy we simply emphasize the fact that the most advanced form of human association has, in Colorado and in Idaho, proved unable to meet exceptional conditions. The horror felt at Orchard's confession is great, but greater is the resentment excited by the contemplation of a series of stupid crimes perpetrated by an ignorant man; there was no personal ambition to gratify, there was no particular skill exhibited, and there was no real object in it all, save a dull protest against the order of things as they are, and a desire to get a little money. To think that a man like Arthur Collins was assassinated, that another engineer like Bradley was so nearly killed, and that a score of good capable men were brutally murdered by such criminal idiots as Orchard and the like of him, while the States of Idaho and Colorado were spending vast sums of money for the maintenance of a police, a military, and a judiciary that with all their united intelligence were unable to stop a series of such wanton crimes, is enough to arouse the profound anger of any thoughtful citizen. It is the breakdown of what we term civilization.

How was it possible for such deeds to be done, not once or twice, but repeatedly, in Idaho and in Colorado, during a term of fully twelve years? Are the people of the mining regions necessarily more lawless? No. Do the American people favor the methods of Russian nihilists or South American revolutionaries? No. Are the owners of mines in the West more tyrannical, or are the workmen more disorderly than anywhere else? No. What then, it may be asked, will explain this orgy of brutality, this long continued state of anarchy, varied by murder? We venture to attribute it, as we attribute many other ills from which we suffer, in the very midst of a triumphant industrial progress, to the absence of a strong public opinion in support of the law. It is due not to lawlessness but to a lack of civic spirit, of patriotism, of any particular motive save the desire of each man to transact his own business, make money, and go ahead. Because there was no crystallized public opinion to uphold the State officers or to give tone to the county sheriff, therefore when a quarrel ensued between the mine-owners and their employees, there was no adequate assertion of the law and the two parties to an industrial squabble were permitted to develop a vendetta. In consequence, the worst elements in the labor party became arrayed against a few fearless men that refused to accept the dictation of those whom they believed to be neither representative of the laboring men nor acting in good faith. The main body of the workmen themselves was intimidated by a few reckless ruffians. The local government, whether county or State, was either incapable or committed to one side of the quarrel, although the conditions varied from time to time. Thus, in the Cœur d'Alene, the sheriff was a member of the mob that dynamited the mills and the district attorney was a member of the labor-union that was responsible for murderous outrages. The governors were afraid of political extinction if they antagonized the labor party by enforcement of the law, for to do that they would seem to take the side of the mine operators. Steunenberg alone was both fearless and just. He was a laboring man himself and member of a typographical union, but he was a good citizen first and a union man afterward. Even he had to call for Federal aid, the State being powerless. As to public opinion, it is hard to find any; the events occurred in the northwest corner of Idaho in a mountainous region, where 2,000 miners were employed and supported a population of 10,000, of whom 90 per cent

were in sympathy with, or else dependent upon, those that murdered and dynamited. For years the people of the region talked in whispers; the community was perfectly cowed. There was not even the simulacrum of a public opinion. The rest of the State and the country generally did not get the facts or else got them through partisan channels; the affair was represented as a fight between labor and capital, between miners and mining companies. A sensational press prevented sensational events from seeming true; instead of the whole United States being aroused to righteous wrath by such a damnable condition of affairs, a few brave men had to make a desperate fight for law and order, without the momentum of an enlightened public interest to make it instantly effective.

And in Colorado affairs were fully as bad. From ranting politicians, like Waite, that played the game of the labor-unions, to a weak-kneed executive like Peabody, who was dominated by the mine-operators, the State of Colorado during the time of industrial riots happened to have governors unfit to enforce popular government. Peabody allowed the mine-owners to use the State troops, he appointed a leading mine-owner as the Adjutant-General, he acquiesced in the deportation of men and in other lawless acts. And these things were done, perhaps it was necessary that they should be done, because public opinion did not give strength to the ordinary administration of law and a low type of politics had undermined the channels of justice. For the brave men—mine managers, mine-owners, and lawyers—that took their lives in their hands when making an effort to assert their rights, we have only whole-hearted admiration, for they faced a terrible fate unflinchingly, but this does not obscure to us the fact that their action was necessitated by the helplessness of the State, that is, the organized community in which these things were done. At various periods one side or the other controlled the machinery of the law, from the sheriff to the adjutant general; the whole miserable fight had the appearance of a party quarrel because the public generally did not take sufficient interest in the assertion of the rights of the community. The effectiveness of legal prosecution was weakened by the lack of public support.

Out of all this nightmare of riot and crime, in contrast to the frothy talk of Governor Waite in Colorado, in contrast to the feebleness of Governor Peabody, in striking contrast to the weak executives that had permitted the atrocities in the Cœur d'Alene from 1892 to 1899, stands Frank Steunenberg, who did his duty simply, knowing that it meant his political death, and suspecting that it might end in his physical destruction. He had a calm and courageous resolve to see order restored. "I propose to bring Idaho back into the United States," he said. Steunenberg seems to have been the one man to embody the insistent right of the community to an obedience of law, by the mine-owner as by the mine-worker, by the rich and the poor, by the employer and the employed. He was a martyr to the cause of popular government in America.

Engineers and Ideals.

ON another page we publish an address delivered by Mr. Frank E. Shepard before the graduating class at the State School of Mines of Colorado. Mr. Shepard is himself a graduate from a splendid technical institute and has had an experience of professional life broad enough to fit him as a mentor to young men. He gave them many good hints, much sound advice, and struck some of those nobler chords to which imaginative youth will vibrate. Most of us who have run several laps in a race that grows more exacting as civilization becomes more complex, will appreciate the suggestion that it is not what you study at school or college that counts, but how you do it. Among our successful contemporaries are men of the most diverse training, those who from doctors became cyanide experts and copper metallurgists, some that were lawyers first and mine managers afterward, others that were electrical or mechanical engineers before they developed special skill as geologists or smeltermen. In youth they had learned how to learn, logically and systematically, and their work in life has been logical and systematic. The amount of knowledge that any man carries under his hat is small; his aim is to apply well the little he possesses, and to know where he can obtain the information beyond his immediate ken. Mr. Shepard gave his hearers some ideals of professional integrity. They are needed. If a man has no high purpose in youth, he is not likely to get it later. Life rubs the edges off the crystalline character and tends to make men morally amorphous. It is a brutal fact that if dabbling in stocks on the strength of information obtained professionally is warrant for depriving an engineer of his degree, then a majority of the financially successful men would have to go without that luminous tail. If commissions are unprofessional, the profession will be thinned forthwith, for in large sales of mines it is rarely that the engineer does not get a commission, a bonus, or a participation in stock. Is it wrong? Assuredly. We agree with Mr. Shepard that it dishonors the profession. Young men nowadays are told to become partners with the capitalist, to get financial sense, to be commercially alert, to have an eye not only to business but to 'peeziness'—the Hebrew pseudomorph of ordinary sagacity. Is the profession to be swamped by the broker, promoter, and financier? Is the big salary or the fat fee to be the single aim of the young graduate of today? Or is there to be a *noblesse oblige* among professional men, an ideal of conduct, a sincerity of purpose? We phrase these suggestions in the form of queries, for it may weary some of our readers if we state them as fierce assertions. Assuredly we believe that the engineer should have ideals higher than those of a hod-carrier, a ward politician, or a bucket-shop broker. The pursuit of the shekel is not the only sport in life and the accumulation of wealth is not wholly satisfying. Many there be that say these things and a few that actually believe them. The young men at Golden will have gained from Mr. Shepard's appeal for a higher standard, and we commend it to the older men also.

Personal.

THOMAS J. BARBOUR is at Paris.

J. F. O'GORMAN is at Guadalajara.

ALBERT BURCH is a witness at Boise.

J. MORGAN CLEMENTS was recently at Butte.

JEROME B. LANDFIELD has gone to eastern Siberia.

BENJAMIN MAGNUS is at Sydney, New South Wales.

GEORGE W. BRYANT has opened an office in Mexico City.

ERNST DENICKE has taken charge of a mine at Johnnie, Nevada.

ROBERT H. CHAPMAN was married at Auburn, New York, on June 1.

C. C. BURGER is consulting engineer to the United States Co. of Cobalt, Ontario.

CHARLES BUTTERS arrived at New York on May 12, on his way to San Francisco.

EUGENE SHEFFIELD has returned to San Francisco from the Cœur d'Alene, Idaho.

E. P. MATHEWSON visited San Francisco on his return from Arizona to Anaconda.

C. A. BOHN is ore buyer for the American Smelting & Refining Co. at Chihuahua.

CYRUS W. MCARTHUR, of Denver, was in San Francisco this week on his way to Montana.

P. H. LUND, of Denver, inventor of the Lund drill-sharpener, is in San Francisco, on his way home.

A. P. ROGERS has returned from South America and is now engaged in professional work in Arizona.

W. H. JEFFREY has left Greenwood, B. C., to become manager of the La Rose mine at Cobalt, Ontario.

G. H. KEELER, formerly at Atlanta, Georgia, is manager for the Las Coloradas Co. at Allende, in Chihuahua.

FRANK J. BOOTH met with an accident in the cyanide mill of the Dolores mine, Mexico, and is recovering from it at Berkeley.

WALTER G. PERKINS has resigned as smelter superintendent for the Nevada Con. Copper Company, and is taking a short holiday.

W. C. THOMAS has been appointed general manager for the Dominion Copper Co. at Phœnix, B. C., in succession to T. R. Drummond.

CHARLES WRIGHT, of Los Angeles, was in San Francisco this week on his way to Goldfield, Nev., where he will inspect several mines.

FREDERICK H. SEXTON has been appointed Director of Technical Education in Nova Scotia and Principal of the Technical College at Halifax.

W. W. ALLEN, having completed his year of service with the Caucasus Copper Co., Ltd., in Russian Caucasia, is returning to the United States.

JOHN A. BALCH, formerly smelter superintendent for the Mountain Copper Co., at Martinez, Cal., has accepted the position of manager for the Wireless Telegraph Co., of Honolulu.

F. S. SHERWELL, recently chief engineer of construction to the Real del Monte Co., Pachuca, has formed a partnership with CHESTER A. FULTON, with offices at Guanajuato, Mexico.

WILSON W. HUGHES has resigned as mine manager for the Guanajuato Reduction & Mines Co. to become general manager for the Ellamar Mining Co. in Alaska. He is now at Philadelphia.

Obituary.

CHARLES E. HOFFMAN died at the house of his son at San Luis Potosi, Mexico, on May 20. He was one of the pioneers in California, coming here in 1850. As a professional man he did a large amount of useful work in several Western States.

Latest Market Reports.

LOCAL METAL PRICES—June 13.

Antimony	22.50@25.50c	Quicksilver (flask)	$38@39.50
Copper	25.75@26.75c	Spelter	7.75@ 8.50c
Pig Lead	5.85@ 6.80c	Tin	43.25@44.75c

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
June 7	23	5¾	6⅞	66⅝
" 8	23	5¾	6⅞	66½
" 9	Sunday.	No market.		
" 10	23	5¾	6⅞	66⅝
" 11	22⅞	5¾	6⅞	66½
" 12	22⅞	5¾	6⅞	66⅞
" 13	22⅞	5¾	6⅞	66⅞

ANGLO-AMERICAN SHARES.
Cabled from London.

	June 6. £ s. d.	June 13. £ s. d.
Camp Bird	1 0 6	1 2 0
El Oro	1 5 3	1 6 0
Esperanza	1 13 9	1 16 3
Dolores	1 6 3	1 5 0
Oroville Dredging	0 16 3	0 16 3
Stratton's Independence	0 3 7	0 3 6
Tomboy	1 19 3	1 16 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, June 13.

Atlanta	$ 52	Laguna	1.05
Belmont	3.75	Little Tonopah	.....
Columbia Mtn	47	Manhattan Con	50
Combination Fraction	2.85	Midway	1.42½
Daisy	1.30	Mizpah Extension	.....
Fairview Eagle	75*	Mohawk	.....
Florence	4.40	Montana Tonopah	3.00
Gold Bar (Bullfrog)	70	Nevada Hills	4.75
Gold Bar (Goldfield)	40	Red Top	2.90
Goldfield Con	6.65	Sandstorm	50
Goldfield of Nevada	1.15	Silver Pick	58
Gold Kewanas	63	St. Ives	1.02½
Great Bend	62	Tonopah Extension	1.90
Jim Butler	1.07½	Tonopah of Nevada	16.00*
Jumbo	3½	Tramp Con	74
Jumbo Extension	1.85	West End	90

* Asked.

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. June 13.	Name of company.	Closing prices. June 13.
Adventure	2½	Michigan	12½
Ahmeek	.....	Mohawk	83
Allouez	40	Nevada Con	12¾
Amalgamated	83¼	North Butte	78½
Arcadian	4¾	Old Dominion	42
Atlantic	11	Osceola	120
Balaklala	7¾	Parrot	19
Bingham Con	15	Phœnix	1
Boston Con	23½	Quincy	111
Butte Coalition	24⅜	Raven	1¼
Calumet & Arizona	154¼	Rhode Island	4⅜
Calumet & Hecla	770	Santa Fe	2½
Centennial	24½	Shannon	17¼
Con. Mercur	37	Superior & Pittsburg	16½
Copper Range	76½	Tamarack	102
Daly-West	15½	Trinity	19
Franklin	13	United Copper com	64
Granby	120	Utah Copper	53
Greene-Canauea, ctf	15½	Victoria	6¼
Isle Royal	15	Winona	7
Mass	4¼	Wolverine	150

(By courtesy of E. F. Hutton & Co., 490 California St.)

MINING STOCK QUOTATIONS—NEW YORK.

	Closing Prices May 29.	June 13.
Bingham Central	1⅛	1¼
Boston Copper	26⅜	23⅞
Cumberland Ely	8	8
Dolores	7¼	6½
El Rayo	5⅜	5¼
Guanajuato Con	3¾	3¾
Giroux Con	8¾	8⅞
Greene Con	22	26⅛
Nevada Con	13¾	13
Nipissing	12⅞	11⅜
Tennessee Copper	36½	37¼
Tonopah Ex	2	2
Tonopah-Belmont	4	3
Tonopah	15⅝	15
United Copper	58¼	64¼
Utah Copper	25½	25⅞

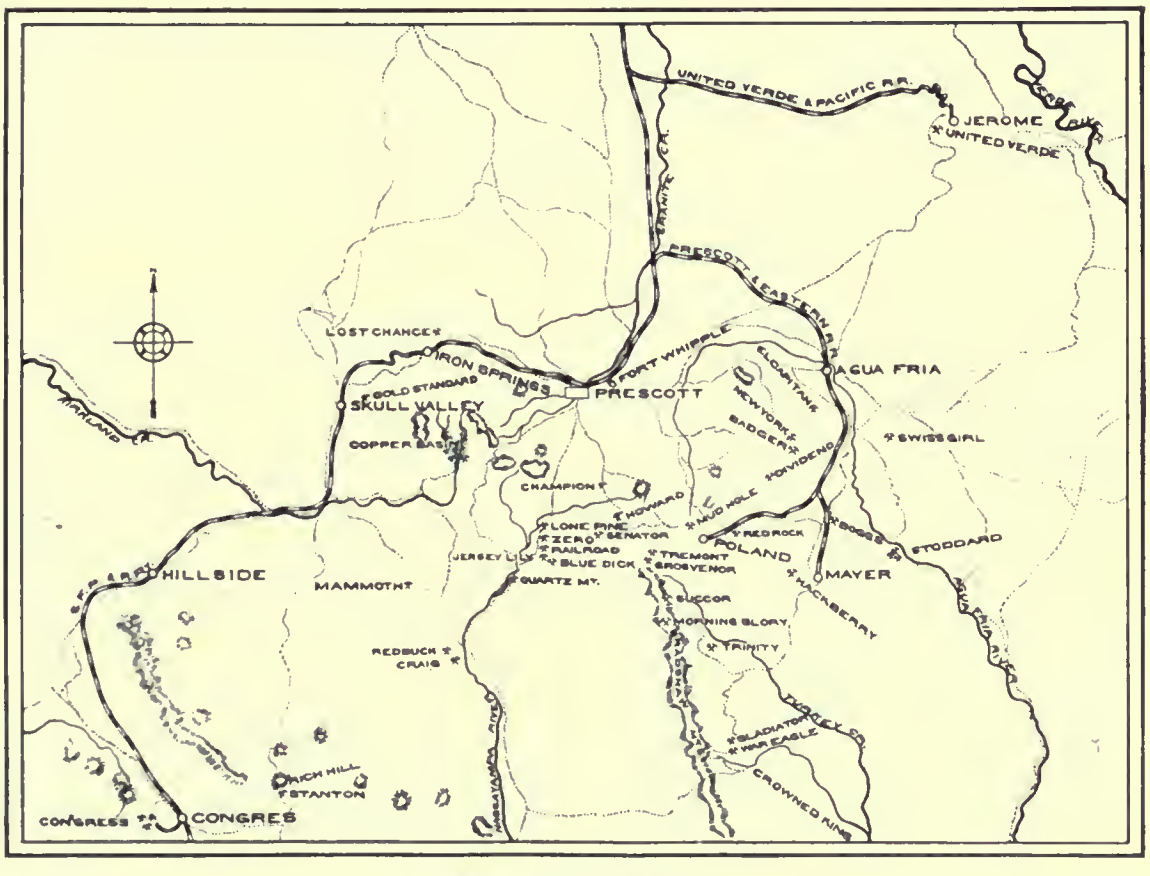
(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

General Mining News.

ALASKA.

KETCHICAN.

H. W. Turner has taken a force of men to the Skowl Arm property of the Omar Mining Co., on Prince of Wales island. This company was mismanaged under the former chief, and a tramway and wharf were built before a mine was developed. There are reported large bodies of sulphide ores, running high in sulphur, and shipments of this class of material will be started at once, as there is 1,000 tons of ore on the wharf.—— The compressor has been installed at the Crackerjack property, and the Puyallup water-power will be used to operate it.—— Work at the Rush & Brown is progressing well, and ore is ready for shipment to the Tyee smelter.—— Work will be resumed at the Moonshine property under the direction of B. C. Bacon. The mine will be opened by a tunnel.——One of the lenses of ore revealed by the diamond drill at the Mamie mine has been opened by a cross-cut tunnel. It is expected that a monthly production of about 3,000 tons will be attained.



Map of a Part of Arizona.

ARIZONA.

COCHISE COUNTY.

The Board of Trade at Bisbee has been for some time trying to get freight rates reduced on El Paso & Southwestern railroad. Every merchant and citizen suffers from the exorbitant rates. It is claimed that the E. P. & S. company charges $1.82 per hundred for a haul of 248 miles, while Eastern roads get $1.74 for a haul of 2,167 miles. The matter will probably be brought to the attention of the Interstate Commerce Commission.——The production of the smelters of the Warren district for May were: Copper Queen smelter, 9,500,000 lb.; C. & A. and S. & P., 4,000,000 lb.; and Shattuck & Arizona, 650,000 lb. of copper.——A new hoisting engine is being installed at the Czar shaft of the Copper Queen.——The sampling works of the Copper Queen smelter, at Douglas, are being enlarged to accomodate the increasing business of the plant. The last of the material for the 125-ft. extension on the east end of the smelter has arrived.

The work of excavating for the new power-house for the Copper Queen company, between the Gardiner and Sacramento shafts, is well under way. When completed, this plant will supply electrical power and compressed air for all the Copper Queen mines, with the exception of the Gardiner and Sacramento shafts, which will use steam throughout. The prospecting drift from the Cuprite shaft in the direction of the Shattuck mine, has connected with the drift from that property. This makes the ventilation better, and it is now possible to go down in the Czar shaft and travel underground to the Shattuck. The work of re-timbering the Czar shaft from the 200-ft. level to the surface is nearly completed.—— The contracts for the erection of the smelter of the Shattuck-Arizona company will probably be signed this month. In the mine, the drift on the 900-ft. level has encountered ore. On the 700 and 800 levels, ore is being developed that is furnishing the shipments to the smelters. An average daily shipment of about 300 tons is maintained. A new Corliss 30-drill compressor is being installed, and will be in operation in July.—— At the Denn-Arizona, the drift on the 1,100 level has encountered several bunches of ore. The shaft will be sunk to the 1,200-ft. level, the railroad spur to the Denn will soon be finished and the company will install three 50,000-gal. fuel-oil tanks. ——The shaft on the Warren property is 230 ft. deep and 15 men are employed. The shaft will be continued for several hundred feet before any driving is done.——The shaft on the Cochise Development Co.'s property is 930 ft. deep and drifts are being run on the 600 and 900-ft. levels.——At the Domoerata, a winze is being sunk in ore, that will go to the 600-ft. level. This mine now has the greatest actual depth below the surface in continuous workings, of any property in the district.——Shipments during the past two weeks from the Cole shaft of the Superior & Pittsburg were the greatest since it has been in operation. At the Hoatson shaft, sinking is progressing rapidly. Operations will soon be commenced at the Briggs shaft.——The Calumet & Arizona company has paid $2,000,000 in dividends for the five months in the current year, making a total of $8,00,0000.

MARICOPA COUNTY.

The Unida Gold M. Co., 14 miles east of Wickenburg, is working steadily. A 25-h.p. hoist is in operation, and teams

have been hauling ore to the railroad and a shipment will soon be made to the smelter. The main shaft will be sunk 500 ft. without delay. George Margreti is the superindent.

GILA COUNTY.

(Special Correspondence).—Plans for the enlargement of the Old Dominion Co.'s surface works at Globe are engaging the attention of the local management. The structural steel for the extension of the smelter building, delayed by the congestion of freight on the Rock Island railroad, has been traced and its delivery is promised at an early date. Construction will then proceed rapidly and No. 5 furnace should be in operation by July 1. The plans include the installation of another furnace, the construction of an additional dust chamber and the erection of another stack 200 ft. high, and having double the capacity of the present stack. These and other enlargements will require the remainder of the year for their completion. Of importance in this connection is the enlargement of the smelter ore-bins, to be undertaken at once. The capacity of the bins, now 3,600 tons, is to be increased to 4,800 tons by an extension 72 ft. long. Sixteen new automatic charging scales will be added, so as to load six charging cars at one time instead of three cars, as at present. The smelter has been running at full capacity, with four furnaces in blast since May 1, and the output of copper has averaged better than 50 tons per day, which means a production for the month of 3,000,000 lb., barring any interruption of smelting. Receipts of coke have increased and a reserve is being slowly accumulated. The company has an enormous amount of supplies in transit, shipments aggregating 2,000 cars, of which 1,800 cars are coke.——The Continental mine is contributing high-grade sulphides, and the United Verde, Gibson, and Arizona Commercial mines are making regular shipments, mostly sulphides. Custom ores are still being purchased and what is not sold to outside smelters is stored. The supply of ore promises to exceed the capacity of the smelter, even after the two new furnaces have been installed.——Operations are now on a larger scale at the Copper Hill mine, and ore shipments have been increased to 200 tons per day. Of this amount 130 tons is sulphide ore, which goes to the Old Dominion smelter, and 70 tons of silicious ore is shipped to the Douglas smelters. Only three cars of ore have been shipped from the Blackhawk mine thus far. The sulphide orebodies in the Copper Hill look well and development work is being carried on. Two new boilers for the mine have been shipped from the East. At the Blackhawk sinking is progressing rather slowly at the depth of about 550 ft. The pumps are raising about 275,000 gal. of water per day. A Prescott pump of 500,000-gal. capacity has been ordered. The Arizona Commercial railroad is hauling all this company's ores, as well as sulphides for the Globe Consolidated, the Iron Cap, and Superior & Boston, taxing its present capacity. Another and larger engine has been ordered.——During the past week a small vein carrying hematite was encountered in the north cross-cut of the Gem shaft of the Globe Consolidated, and for a time it was thought that a strike had been made. On account of the flattening of the vein from 80° on the 500-ft. level, it was at first supposed that the vein was wider than it is. Work in both cross-cuts on the 500-ft. level has been hampered during the past week by the flow of water, which necessitated the use of buckets for hoisting water much of the time. However, the water is not increasing, and after some timbering is done, work will be pushed. Pumps and pipes are on the ground and will be installed at once to handle the water. The formation in the south cross-cut shows signs of mineralization, while the north cross-cut is in porphyry, with some traces of iron. Sinking in the shaft is still progressing, with no change in the formation.

Phœnix, June 8.

MOHAVE COUNTY.

Work is progressing on the Frost-Mehaffy properties, at Wallapai Springs, and some good ore has been opened. The Tawa Development Co. has a shaft down 200 ft., which has opened a seven-foot vein carrying an 18-in. streak of shipping ore.——The Benedictine M. & M. Co., operating at Cedar, may build a 28-mile electric road from Yucca to the mine and mill. The company owns 40 claims, and is operating the Arnold properties. The mill has a capacity of 150 tons per day, and is to be increased to 1,000 tons. Amalgamation, cyanidation, and concentration are used in treating the ore. The company is capitalized for $20,000,000, and also owns properties near Prescott, and in Yuma county, near Kofa.——The Cerbat Mtn. Mining Co. shipped a car of concentrate and a car of first-class ore to the smelter last week. The mill is running steadily on ore from the Vanderbilt mine.——The Gem mill has been running steadily on ore from the Golden Star Co's properties, and two carloads per week of concentrate are shipped.

YAVAPAI COUNTY.

H. J. Beemer has struck more rich ore in the Storm Cloud, in the Hassayampa district, 12 miles south of Prescott. The strike was made in a drift at a depth of 250 ft. About 35 tons of ore per day is shipped from this property, by way of the Poland tunnel, to the smelter at Humboldt.

YUMA COUNTY.

At the annual meeting of the Victor & Bell Crown Mining Co., at Salome, the following officers were elected: John B. Martin, president and manager; J. H. Matteson, secretary and treasurer; and F. C. Piper, T. H. Finnegan, W. E. Enos, and R. R. McDonald, directors. The seven claims of the company are in the Harcuvar Mtn., eight miles north of Salome. Several shafts have been sunk, and a contract has been let to sink to the 250-ft. level on the Belle Crown.

CALIFORNIA.

AMADOR COUNTY.

The pipe-line, for carrying fuel oil from Martell to the Kennedy mine, has been completed. This ought to eliminate any future trouble for the Kennedy, as far as fuel is concerned.

CALAVERAS COUNTY.

The Moosehead placer property, 12 miles from San Andreas, has been purchased by New York people. This mine adjoins the famous Sheep Ranch quartz mine. The organization will be known as the Moosehead Water, Power & Mines Co., and will be financed by William V. Holley, a New York broker. Several hundred prospecting pits have been sunk. Two giants are now in operation, and a five-stamp mill is on the ground.

NEVADA COUNTY.

The Banner mine, on Banner hill, will be pumped out at once. Operations were discontinued on this property last winter, on account of the lack of fuel.—— The outlook at the Fairview mine is promising. The main tunnel is in 400 ft., and will be driven 600 ft. farther. A winze is being sunk from the 300-ft. level of the Murchie Extension. C. M. Wilson is the manager.——Good ore has been struck in the Canada Hill Consolidated mine, commonly called the Charannat. The vein is strong and the ore a free-milling quartz.——The Kendalls of Alameda are trying to buy the Republic mine, at Graniteville.—— It is rumored that the Campbell Blue Point gravel mine has been bonded.——The Ethel mine, near Gaston, has just been examined by engineers.——The annual meeting of the directors of the Alleghany Mining Co. will be held in San Jose June 17. The property of the company suffered serious damage during the winter, owing to snowslides and floods. W. W. Tiner is superintendent.

EL DORADO COUNTY.

The Pilot Hill mine is bonded to Alameda people, and the Coster mine at Cooper's ravine has been bonded to a Colorado company.——Work has been resumed on the Noonday copper mine, below El Dorado, and the shaft will be sunk 200 ft. deeper. The owner is the Peyton Chemical Co., which uses the ore largely in the manufacture of sulphuric acid.——The shaft on the Pacific Union mine, superintended by John E. Sexton, has reached gravel.

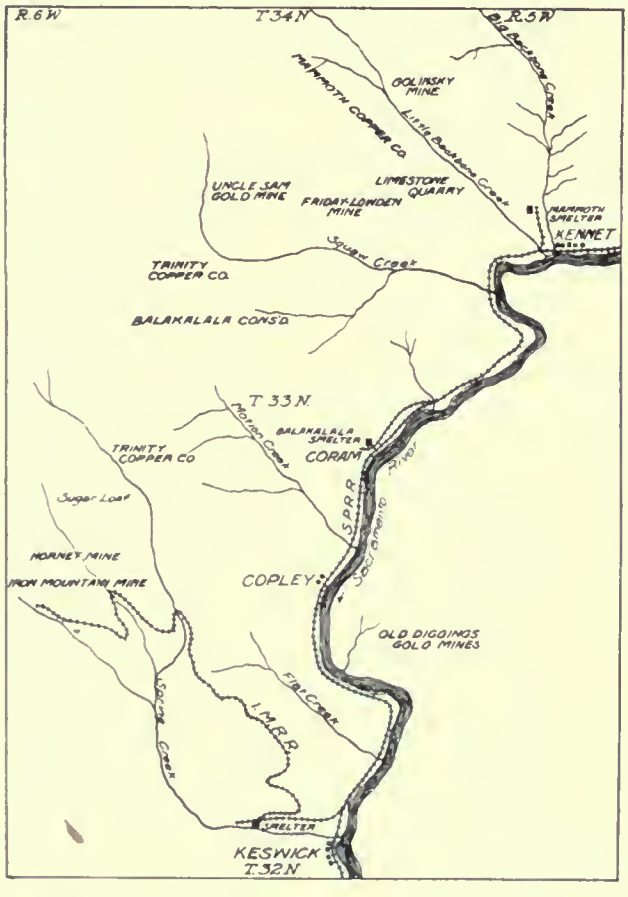
PLACER COUNTY.

The new pump for the Crater mine has arrived and will soon be working. The shaft is 800 ft. deep, and it will take five weeks to unwater it.——A tunnel is being run on the

Three Queens property, from Volcano cañon, parallel with the lode. Shafts will be sunk on the outcrop.——The Evening Star property is being examined and may be operated again.

SHASTA COUNTY.

Systematic diamond-drilling is in progress on the Stowell property, by interests identified with the Balaklala company.——A small force of men is developing the Copper King property on Motion creek, which is a part of the Trinity Copper Co.'s holdings. Morgan Thomas is directing the work.——The Mountain Copper Co. will employ 30 men on the fractional claim near the Weil tunnel of the Balaklala company. A double-compartment shaft will be sunk.——About 25 men, under Eugene Bergath, are employed at the Sugar Loaf mines, west of Coram.——The Vulcan group, between the Balaklala and the Shasta King,



Map of the Copper Region in Shasta County, California.

has been incorporated under the name of the Great Verde.——In the Lower Springs district, west of Redding, the Stauffer Chemical Co. is developing a good orebody in the Conner property, which it has under bond.

TUOLUMNE COUNTY.

Grading is finished for the new mill at the Ellen Winton, and the mill is being erected.——R. B. McGinnis has completed an examination of the Wide West claim.——A force of men is being secured for the Kanaka property.——The new compressor for the Big Casino mine has arrived.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Edward Butts & Co., working a large block of ground under lease in the Aston mine, on Democrat Mtn., have a streak four inches wide of ore which assays 4,000 oz. silver per ton; alongside of this streak there is two feet of ore which assays 394 oz. silver per ton. No work has been done in the Aston mine for the last six years. The mine is owned by the Red Oak Mining Co., for which A. B. Montgomery is the general manager.——The Capitol Mining Co. has commenced grading for its new power building. A 100-h.p. boiler and 20-drill air-compressor will be installed. The company's main adit is now in 4,400 ft.; several fine lodes have been intersected, one at 4,000 ft., showing three feet of ore which mills $30 per ton. Laterals will be driven on several of the lodes and a concentrating mill will probably be erected.——B. L. O'Connell, leasing on the Frostberg lode of the Mendota mine at Silver Plume, has uncovered a foot of lead ore which mills $70 per ton. The lease is being worked through the Victoria tunnel, a winze having been sunk 125 ft., from the bottom of which a drift was run 200 ft., and stoping commenced.——The Ramsdell Gold M. & M. Co., operating on Lincoln Mtn., has commenced grading for a 75-ton concentrating mill. Geo. W. Teagarden is general manager. A body of good concentrating material is now opened up in the mine.——Ore which gives returns at the mill of $60 per ton in gold and silver, with 40% lead, has been discovered in the Captain Billy Neach property on Young Mtn. in the Atlantic mining district; the property is owned by the Vigilant Mining Co.——Work has been resumed on the North Star mine in East Argentine. Drifts will be run on a streak of high-grade silver-lead ore. A number of the Rock Island railroad officials are financing the enterprise. Mr. Bonham is the local manager.——Jim Jones & Co. have been awarded the contract for putting through the raise from the Scepter mine to the Sunburst adit on Democrat Mtn.; there is still 165 ft. of ground to be broken before the connection is made. The mines belong to the Red Oak Mining Co. When the connection is made all the company's ores will come out through the Scepter adit on the Georgetown side of the mountain, saving much expense in hauling ——The mines at Empire are again coming to the fore. Ten sets of lessees are at work in ore on the Golddirt mine, owned by the Empire Tunnel Co., of which Clarence Jarbeau, of Georgetown, is the manager, C. C. Wilder, leasing on the fifth level, is shipping 40 tons of smelting and 105 tons of concentrating ore weekly. Benzel and Brancase ship 25 tons of ore weekly, which averages six ounces gold per ton. The Mint mine, belonging to the Benzie Investment Co. of Denver, is making shipments of ore.——From the present outlook, much greater activity in this district is expected than has been the case for many years.

Georgetown, June 9.

SUMMIT COUNTY.

(Special Correspondence).—That portion of Summit county comprising Montezuma and Argentine districts shows considerable activity in a mining way. It is reported that the Colorado & Southern railroad will extend its tracks from Keystone, the present terminus, to the forks of the creek about one mile below the town of Montezuma. A project is now on foot to build a surface tramway, similar to the one in operation in Gilpin county, from the forks of the creek to the horseshoe above Rathbone or Argentine, to connect with the Vidler tunnel which is being pushed through the mountain from the Georgetown side and which it is estimated will be completed in about seven months. Should this work be accomplished it will be the means of opening up a large territory heretofore practically worthless on account of the long distance to the railroad.——It is understood that Mr. Leebrick of Idaho Springs has secured control of the old Bullion mill at Montezuma and is putting it in shape to handle lead and zinc ores from this district. The mill will be operated by electric power.——Word has been given out that the Pennsylvania mill under the management of W. B. Lewald is to be increased in capacity from 200 to 300 tons per day. Machinery has already been shipped for the Lenawee mill which will be increased to 200 tons per day.——Machinery is being installed by the Argentine Electric Light & Power Co., to generate 1,000 h.p. for use in the two districts.——The sale of the ditch and water-rights of the Oro Grande Placer Co., of Dillon, is reported as having been made to W. B. Lewald of Montezuma and W. H. Foster of Dillon, who will erect a large electric plant near Dillon for power purposes.

Montezuma, June 7.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—Charles H. Reeves, of Spokane, one of the owners of the Hercules mine, has bought

250,000 shares of the Sunrise Mining Co., which owns a group of 11 claims in the Cœur d'Alene. The property is a mile west and a quarter of a mile north of the Hercules mine. The capital stock was recently increased from $1,000,000 to $1,500,000, the new issue of 500,000 shares being put into the treasury. C. H. Reeves has been elected president; O. C. Smith, vice-president; and Bruce Worstell, secretary and treasurer. J. N. Rice and George Blue are the other members of the board of directors. The lower tunnel, No. 3, has tapped the orebody. No. 3 tunnel is in 935 ft., and has attained a depth of 360 ft. below the showing in No. 2 tunnel, and a total depth of approximately 500 ft. The vein had been cross-cut 25 ft. before the orebody was broken into. The same shot which opened up the ore started a big run and a heavy flow of water, so that as yet the extent of the deposit has not been ascertained. In No. 2 tunnel the orebody was followed for 200 ft.——At a recent meetlng of the newly elected directors of the Tamarack & Chesapeake Mlning Co. in Spokane, it was decided to build a 100-ton concentrator, a mile-long tramway, and to install a 30-drill compressor as soon as possible. The work will cost $100,000. There are $30,000 in the treasury, and 220,000 shares of stock unissued. The mine is up a branch of Nine Mile creek, six miles from Wallace. Ore worth $25,000 is awaiting shipment to the smelters. The company expended $35,000 in development and improvements the last year. The tunnel has been driven 1,500 ft., and the mine is said to be in excellent condition. The officers and directors are: President, treasurer, and manager, Harry L. Day, Wallace; secretary, F. M. Rothrock, Spokane. The board of directors is composed of the officers, and Eugene R. Day, Jerome Day, E. H. Knight, J. H. Wourms, Dan. P. Bagnell, Edward Boyce, and C. Fred Kratzer.—— Three rich ore strikes are reported in the Golden Chest mine at Murray. The find was made on the lower 2,600-ft. cross-cut tunnel and two veins were opened. The first vein is five feet wide, and the vein beyond, two feet. The first is on the contact between quartzite and slate. The strike was made 1,000 ft. below the outcrop, and is a direct contradiction of the statements made that the mines of the north side lose by depth. The mill at the mine has been closed three years, during which time the development work has been extensive. Two shifts of 40 men, with three machines, are blocking out ore.——Improvements in mine and mill are being made at the Snowstorm, near Mullan. Several sidetracks are being put in by the Northern Pacific railroad, and a station is to be established at Larson, so that shipments can be made direct from the property. A 300-h.p. air-compressor is being installed, and will be operated by water-power to supply air to the various levels of the property. A 20-drill compressor has also been ordered, to be installed in the building with the 18-drill compressor now supplying air for operations. The mill is being enlarged, and three leaching tanks of large capacity will be added. Ore between two and three per cent is being treated at the mill, while the greater mass of ore now being taken from the east drift on No. 3 level, running above eight per cent copper, is shipped direct to the smelter. Bunk and boarding houses are being erected at the mouth of No. 3 tunnel and at the mill. These will accommodate 300 men. The cost of the improvements has been estimated at $500,000.

Spokane, June 10.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—Twenty cars of ore, averaging $250 per car, were shipped from the mines here during May. Machinery is rapidly arriving. It is reported that a branch road will be built to this camp by the S. P. Co. ——Ore running $200 per ton has been uncovered in tunnel No. 3 at the Nevada Hills. A five-foot vein of quartz has been found in tunnel No. 5, and ore has been discovered in the cross-cut in the 100 level of the shaft. The non-arrival of the hoist has compelled the suspension of shaft-sinking. ——The head-frame is in place at the Dromedary Hump, but operations are greatly hindered by the non-arrival of the hoist. Such work as is being done shows some ore.—— A new hoist has arrived for the Golden Boulder and is being installed. Sinking will be carried on from the tunnel.——The main tunnel at the Ida is in 300 ft. and is being extended 18 ft. per week. No. 2 shaft is down 90 ft., with cross-cuts running northeast and southwest. Shaft No. 3 is down 45 ft. All the shafts and tunnels are in ore, and a large force of men is employed.——At the Wyoming-Fairview, the shaft is down 40 ft.——An 18-h.p. hoist has been ordered by the company.——Development is steadily progressing at the Fairview Red Rock, and several men were recently added to the force.

Fairview, June 12.

ESMERALDA COUNTY.

(Special Correspondence).—During the week ending May 25, 1,532 tons of ore was shipped from the Goldfield mines. The output was from the following properties: Mohawk, 230 tons; Francls dump, 220; Loftus, Davis & Sweeney lease, 183: Morton-Beesley lease, 145; Combination, 138; McNaughton lease, 87; Oddie lease, 240; Truett lease, 67; Jumbo, 33; Quartzite, 75; and Mohawk-Jumbo, 5 tons of ore.——A six-foot vein has been found in the 275-ft. level on the Red King claim of the Little Florence. Samples of the ore run well.——The Elk Con. M. & L. Co. has been granted a three-year lease, at a royalty of 25%, on the Jackass group. Under the terms of the lease, a three-compartment shaft will be sunk to a depth of 500 ft. by Jan. 1, 1908. The company is composed of Colorado men. ——The Mohawk-Florence vein has been penetrated, and a body of low-grade ore found on the other side.——The shaft at the Baby Florence is down 60 ft., and a 25-ft. cross-cut is being driven from this point. The new hoist has been installed.——Cross-cutting is under way on the 235-ft. level of the Atlanta, and some good ore has been found.——A 30-h.p. gasoline hoist has been installed on the Lucky Scotchman, and the shaft is down 80 ft.——The shaft of the Jumbo Wonder M. Co. is down 125 ft. and is being sunk. The mine is well equipped.——Ten carloads of ore is ready for shipment at the St. Ives and development is rapidly progressing. The shaft of the lessees is being rapidly sunk, and a cross-cut will be driven to connect with the cross-cut from the main St. Ives shaft. A compressor will soon be installed.——The Goldfield Monarch Co. is sinking a 400-ft. shaft on its holdings. A small vein was encountered at a depth of 35 ft. A 20-h.p. hoist has been installed, and two shifts are employed.——The shaft at the Third Chance has attained a depth of 115 ft., and at the 110-ft. level a small vein running $30 per ton was found.——Walter C. Stone, M. J. Monnette, Hugh Trenholm, J. T. Andrus, and W. C. Wylie have purchased a group of claims at Phillipsburg, northwest of this city, and are organizing a company to develop the property.

Goldfield, June 2.

HUMBOLDT COUNTY.

(Special Correspondence).—At the Brown Palace, two tunnels are being driven, a double-compartment shaft being sunk, and surface prospecting under way. Some ore has been encountered.——The Rabbit Foot group has passed into the hands of the Schwab interests. The purchase price is said to be $90,000.——On the Florence group a 12-ft. vein has been struck.——A three-compartment shaft has been started on the west end of the Dreamland, and will be sunk to a depth of 300 ft. From this point drifts will be run. Ore has been found at a point 80 ft. east of the 60-ft. prospect shaft.——A strike has been made in the Big Six, selected samples of the ore running well. The surface outcropping is 60 ft. wide. The mine is owned by the Schwab interests.——Development at the White Alps is steadily progressing, some excellent ore having been extracted. Salt Lake people own this property.——A lode carrying gold has been struck in the Golden Anchor.——The Powhattan and Rattler mines are showing up well.

Rosebud, June 6.

NYE COUNTY.

(Special Correspondence).—A 120-h.p. steam-hoist has been installed at the three-compartment shaft at the Montgomery-Shoshone mine, and the new reduction works are being erected with the utmost celerity. The main shaft is down 500 ft., and ore is being blocked out. A car of high-

grade ore is shipped daily to the Salt Lake smelter, while 20,000 tons of low-grade ore is stored on the dump. When the plant is completed it will handle about 375 tons of ore per day. Bryce Turner is manager of the mine.—— The main shaft at the Gold Bar is down 425 ft., and the orebody has been proved for 1,100 ft. on the 150-ft. level, and 2,000 ft. on the 300 level. A 20-h.p. hoist is at the mine, and reduction works will soon be installed. A small shipment of ore from the Gold Bar averaged $341 per ton. Good strikes of ore have been made in the 115-ft. level, and in the 175-ft. drift from the 200-ft. level. The ore-shoot in the 200 level runs well. At other points the mine is looking well, and L. P. McGarry, the superintendent, is pleased with the outlook.—— The Combination and Washington properties, comprising 16 claims, and situated in the Lee district, have passed into the hands of the Gold Bullfrog M. Co. The company will build a mill at Gold Springs, 10 miles north of

Map of Southwestern Nevada.

this city, where it owns a water right. A mill is also being built seven miles north of here by the same company, and will soon be in operation.—— The owners of the Tramp Consolidated mine are preparing to erect a mill at an early date. Developments are opening up some low-grade orebodies.——At the Mayflower, development is steadily progressing.——Springdale, the new camp north of this city, is attracting attention from local miners, on account of the strikes made in the Oasis Bullfrog, Aurora Bullfrog, Springdale, and Bullfrog-Mogul properties. The formation and general characteristics of the ore resembles that found in the Mayflower. The camp is on the Goldfield & Tonopah railroad, while the Clark road is a short distance west, with the Borax Smith road building to the camp. Plenty of water is available, and two electric-power companies are in the field to supply the mines and mills.

Rhyolite, June 7.

(Special Correspondence).—The old camp of Reveille is enjoying a revival of mining activities.——The Nevada Smelter & Mines Co. is operating two gasoline hoists on their recently acquired properties. The main shaft is down 300 ft., while another is down 200 ft. The ore carries silver and lead.——A small vein carrying a little gold was recently encountered in the Granny mine. The shaft has reached a depth of 200 ft. and will be sunk to the 300-ft. level. Some silver-lead ore has been tapped in a cross-cut from the 70-ft. station of the main shaft in the Homestake.——A good strike of gold-bearing ore was recently made in the Iron Mtn. claims, five miles north of Reveille. A hoist will be installed at once. J. C. Hadley is the company's local manager.

Reveille, June 9.

WASHINGTON.

SPOKANE COUNTY.

While working in the Spokane Tin Mines Co.'s properties, six miles east of Spokane, miners encountered a vein of tungsten ore 600 ft. from the shaft now being sunk in the tin deposit. A picked sample assayed 33% tungsten concentrate, or about $300 per ton tungstic acid. The shaft in the tin ore is 45 ft. deep in the hanging wall and the showing continues good. D. P. Bagnell & Co., of Spokane, have taken an option on 450,000 shares of treasury stock in the company incorporated for $150,000. Charles Thies, secretary, announces that as soon as the length of the tin vein is determined a shaft will be sunk. Development work on the property bears out the reports of the strike made a short time ago. Ore is being taken out as the work advances, the best assay thus far being $200 per ton. An open-cut is being run to ascertain the length of the ore-shoot, and this cut has now reached 60 ft., 35 ft. of which is in ore. The pay-ore varies from four to six feet in width and is said to average 10% black tin concentrate assaying 70% tin.—— Eighteen inches of clean coal was found by well diggers at Hillyard, near Spokane, at a depth of 180 ft. The vein, dipping at 45°, was encountered between walls of slate. The coal was tested and burned well, but left a clinker. The find was made two weeks ago, but was kept secret till enough work could be done to show the vein. The well has been driven farther and water secured, but the pumps have not been put in, as the company is exploring to learn more about the deposit. The Hillyard Water Co., which made the discovery, owns a half-block of land in the vicinity of the well. The rest of an 80-acre tract is owned by the Spokane Suburban Co., in which Arthur D. Jones is the principal stockholder.

The work of development on the tin mines on Moran prairie, eight miles south of Spokane, where a find was made by Richard Marsh recently, is to go on in earnest. The company has been organized and the work of gaining depth will be continued by hand to a depth of 75 to 100 ft. If the showing continues to that depth, machinery will be installed and extensive work will begin. The Spokane Tin Mines Co. has elected directors and these directors have named Charles Robbins, president; Richard Marsh, vice-president; Charles Thies, secretary and treasurer. The company is incorporated for $1,500,000, with the following directors: Charles I. Robbins, Charles Thies, Richard Marsh, William Huntley, and W. J. C. Wakefield.

OKANOGAN COUNTY.

(Special Correspondence).—A stringer which has been followed by the lower tunnel on the Security, a Palmer Mtn. property near Loomis, has widened to a two-foot vein of well-mineralized white quartz. Several prospecting tunnels have been run in on this property, where the ore outcrops, and gold and silver ore has been exposed.——An assay at the 200-ft. level on the Copper World extension gives $24.60 in copper. This vein is 20 ft. wide where first cut and a drift from this cross-cut has been run to the west a distance of 120 ft. along the foot-wall of the orebody. Another cross-cut made at that point shows the ore to be 30 ft. wide.——A survey for a tram, to be run from the mine to a point on Palmer Mtn., four miles from the V. V. & E. railroad, is soon to be made. It is the intention of the company to construct the tram this summer and ship ore to the smelter at Grand Forks.——Monroe Harmon, general manager of the Ruby mine at Nighthawk camp, northwest of Oroville, says that as soon as the railroad spur is completed to the mine he will begin to ship ore. The mine has been opened by a mile of tunnels, shafts, winzes, drifts, and raises, and in addition to the 500 tons of ore now in the ore-bins, the mine can produce steadily high-grade ruby-silver ore. A concentrator will be built.

Spokane, June 8.

Special Correspondence.

Cobalt, Ontario.

Increased Shipments.—New Discoveries.—Extension of Productive Area.—The Temiskaming Mine.—The Beaver-Cobalt Co.—The Rochester and Cochrane Properties.—The Progress.—Activity at the North End.—Recent Finds of Rich Ore.

Increased shipments, the result of slightly improved condition of roads and warmer weather; some surface finds (those at the Nipissing and Buffalo being particularly rich); and an encouraging development at the south end of Coleman township are the dominant features of Cobalt today.

From January 1 to May 25 the total output was 4,120 tons. The output during 1906 amounted to only 5,129, so that it is apparent that there will be a large increase this year. The Nipissing, O'Brien, Coniagas, Buffalo, Trethewey, and Jacobs are the leading shippers. Among the new mines the Right of Way and the Temiskaming are sending out very rich ore. The last mentioned has received the smelter returns for its first car-load of less than 27 tons. It netted, after paying freight and smelter treatment, $90,000. It is this mine that has created such interest in the southern end of Coleman. Last year it was termed a wild-cat. It has now proved itself. They started to sink on a mere calcite stringer and as depth was attained native silver was found at 45 ft. and at 75 ft. a rich orebody was reached. The main shaft is sunk right on the vein and it is now down 82 ft. and 250 ft. of driving has been done at the 75-ft. level. A winze has been sunk from this drift, at a distance of 113 ft. from the shaft, for 35 ft. and for the last 29 ft. the vein has widened to two feet, a mass of calcite and silver, with some niccolite. Less than 4% cobalt is found in the ore. In this respect it resembles the Silver Queen ore. There is a six-inch calcite vein with a little silver on the property that crosses the main vein. A 40-ft. shaft has been sunk on it and a cross-cut will connect it with the main vein. Both will be worked from the main shaft, which is a well-timbered 5 by 9-ft. double-compartment shaft. There is another 2-ft. calcite vein that carries silver. A shaft is sunk on it to a depth of 30 ft. The wall-rock is not heavily impregnated with silver, as where the veins are narrow and very rich. Nevertheless the screenings from the wall-rock at the Temiskaming are sacked. They carry from 350 to 600 oz. silver per ton. This mine will make a second shipment of 30 tons of rich ore and a ton of second-grade ore this month.

Floyd Harman, the superintendent of the Temiskaming, has mined in Idaho and other Western States and is a firm believer in underground exploration.

Several buildings have been erected, including an 18 by 93-ft. power-house, but the delay in getting machinery is a serious handicap. A 100-h.p. boiler and a six-drill compressor have been ordered and the boiler has arrived, but owing to bad roads it has not yet reached the property. The serious handicap at Cobalt today is the delay in getting machinery.

The 20 acres adjoining the Temiskaming is owned by the Beaver Cobalt Co. This company has erected first-class buildings and a good plant, including a 14 by 22 duplex Rand compressor, an 80-h.p. boiler, a hoist capable of lifting 3,500 lb. 100 ft. per min. Air-drills are in operation and seven veins have been found. The main shaft is down 60 ft. and will be continued to 125 ft., with drifts at the 75 and 125-ft. levels. They have a 14-inch calcite vein containing silver, and a new vein has been discovered on the surface that is five inches wide and is composed of cobalt and calcite. This property should be sacking ore right away. Fifty men are employed at the Temiskaming and 22 at the Beaver. Tom Stephens, superintendent of the Beaver, is a good practical man and will also do a lot of exploration work underground.

At the Rochester mine, which is owned by Cleveland people, a small steam plant is at work, but they, too, are being kept back owing to delay in getting their machinery. The concrete masonry for the compressor is laid but the machinery will not be delivered for a month yet. The main shaft has been sunk to a depth of 90 feet since the end of February. Two good veins have been found but only one is being worked. The main vein had a surface capping of cobalt bloom and galena and is 8 in. wide. Native silver was found two feet below bedrock and the assays from surface down have shown from 916 to 1,500 oz. silver per ton. Eighteen sacks of high-grade ore were taken out of the shaft while sinking the first 60 ft. At that depth the vein dipped; at the 75-ft. level it was necessary to cross-cut 10 ft. to find it. This would be a shipping mine today had they been able to get in their plant. The company has 60 acres in Coleman and is capitalized at $1,000,000.

At the Cochrane a rich vein four feet wide has been uncovered for a couple of hundred feet and a test-pit sunk to a depth of 10 ft. Near the boundary between this property and the Temiskaming a two-foot vein has been found and there are four good veins on this property. A 40-h.p. steam-plant is at work and they have started their main shaft. Good buildings are erected, and, like all other properties in this part of the camp, they are burning the underbrush and making good-sized clearings, as a protection from summer fires. Edward Doherty, the superintendent, came here from the Shakespeare mine, near Webbwood, in New Ontario. He has 20 men at work. J. Wilbur Kay is the managing director and the property is controlled by prominent Cobalt and Detroit men. No stock has been put on the market.

The Crown Prince is now operated by the Duchess Silver Mining Co. George E. Foster, formerly Minister of Finance for the Dominion of Canada, is president. The claim was staked by Earl Prince of Chicago last July and passed inspection in September. He uncovered seven veins and under the present management as many more have been found, four of which are being worked. The main vein from the Cochrane extends to this property, and Sydney L. Smith, the superintendent, intends to explore it vigorously. The Progress mine adjoins. Here Bert Grover, another Western man, has a small plant installed and is doing some underground development on the main vein, which is a strong calcite seam. The shaft is now down 80 ft. and a drift is being run at the 65-ft. level; 17 men are at work here and good buildings have been erected.

Fred. E. Calverley is another man who did a lot of work last summer in this part of the camp. At the Wettlauffer-Calverley property, which consists of 50 acres and adjoins the Progress and Duchess, a fine showing has been made. Adjoining them is the Shutts, where a rich vein has been found running the length of the 20-acre lot and traced to the Hyland 10 acres on the north and from there to the Calverley 10 acres. On the Calumet a rich find has been made in a shaft at a depth of 50 ft. These properties extend south of the Jacobs and Drummond mines, which were long considered to be the southern limit of the rich area and it is only this winter and spring that this extension has been proved to be good. Starting with the Badger and ending with the Calumet is a string of fine prospects and budding mines. One, the Temiskaming, has proved by its shipments that it has as rich ore as anything in the camp.

Activity prevails even further south in the township of

Lorraine and in the unsurveyed territory to the south of that township, where in the diabase and Lower Huronian formation some good finds have been made recently.

At the northern end of the camp and in the township of Bucke a lot of surface prospecting is being done. The United States Co. holdings lie right in the range of shipping mines. The Trethewey and Temiskaming & Hudson Bay finds have made it one of the most promising of the new enterprises. Frederick G. Corning (of the Guanajuato Consolidated Mining & Milling Co. and the British Guiana Gold Concessions Co.) is the president; C. C. Burger, of New York, is the consulting engineer and Stafford Higgings of Toronto is the managing director. They have 120 acres in Bucke, just across the border between that township and Coleman. Eighty acres of their property adjoins the O'Brien syndicate and the La Rose holdings and the third 40 acres adjoins the Temiskaming & Hudson Bay, where a bonanza vein was recently uncovered. Two very strong seams have been found—on one 40 acres and only last week a promising find was made on the lot adjoining the Nancy Helen. It consists of decomposed calcite rich in silver. The managing director came up from Toronto and as a result of his visit, Superindent Sargesson has started a new shaft on the vein.

Salt Lake, Utah.

Production of Zinc.—A Smelter for Zinc Ores.—Shipments From Tintic.—News From Bingham.—New Consolidations.— Park City Mines. Dividends.

The producers of zinc in Utah and Nevada have long been in the need of facilities for the treatment of their ore. Heretofore, ore of this class has been shipped to the reduction works of Colorado and Kansas and, although this procedure has been profitable to the owners of zinc mines, excessive freight rates has made it prohibitive to the movement of the lower-grade ore. In view of the constant increase in tonnage, the need of a zinc smelter nearer home has become more and more apparent and for several months the matter of building a plant of this kind somewhere near Salt Lake has received serious consideration. The announcement was made several days ago to the effect that Samuel Newhouse had become interested in the project and that the well known Salt Lake mining man had practically assured the zinc producers that a smelter would be built. Mr. Newhouse has become interested in Pioche and Good Springs, Nevada, in mines productive of zinc and no doubt that has been one of the reasons which induced him to make up his mind to invest in the enterprise. Zinc has become an important factor in Utah's mineral output during the past two years. The Daly-Judge, Daly-West, and other mines at Park City are producing zinc ore; so are the Horn Silver and Talisman mines in Beaver county, while the Scranton, in the North Tintic district, is recognized as being one of the leading producers of zinc in the West.

The ore shipments from the Tintic district last week amounted to 169 carloads, the contributing mines and respective amounts being: Ajax, 4; Bullion Beck, 8; Beck Tunnel, 12; Centennial Eureka, 52; Colorado, 11; DePue, 6; Eagle & Blue Bell, 1; Eureka Hill, 1; Grand Central, 6; Godiva, 2; Lower Mammoth, 5; La Clede, 1; May Day, 4; Ridge & Valley, 8; Scranton, 6; Tintic Iron, 11; Uncle Sam, 6; Yankee Con., 8; other mines, 2 carloads. The name of the Crown Point Mining Co., operating in the Tintic mining district has been changed to East Tintic Mining Company.

The Utah Apex mine in Bingham is doing well and prospects are excellent. The usual shipments of high-grade ore, about 100 tons per day, are being made, while 200 tons of low-grade ore are being mined for treatment in the Markham Gulch mill. With the showing that the mine has in low-grade ore, the mill could be kept going at double its present capacity indefinitely.——The North Bingham Consolidated Mining Co. has been organized at Provo to operate a group of six mining claims at Bingham. Jesse Knight of Provo is at the head of this enterprise.

The directors of the Utah mine, in the Fish Springs district of Juab county, have given an option on a control of the stock on the basis of $2.50, which means $250,000 of the entire mine. The Utah is a dividend-payer, the usual monthly distribution on the basis of three cents per share.——Amended articles of incorporation of the May Day Mining & Milling Co., have been prepared in accordance with the late deal, by which the May Day company acquired the Uncle Sam, Inez, and Humbug No. 2 fractional mining claims from the Uncle Sam Consolidated Co., for a consideration of 400,000 shares of stock, which was obtained by increasing the capital stock from 400,000 to 800,000 shares. The mill formerly operated by the Uncle Sam Co., has become the property of, and will be operated by, the May Day Company.

The management of the South Columbus Consolidated mine at Alta has announced that regular shipments will begin at once and that it is the intention to market 500 tons within the next 60 days.——Some extensive bodies of low-grade mill-ore have been developed in the Albion mine at Alta, as well as some stuff of shipping grade. This company will probably install milling facilities during the present year.——Ore shipments from the Park City district last month amounted to 8,556 tons of ore, the contributing mines and amounts being: Daly West, 2,440; Ontario, 562; Silver King, 1,639; Keith Kearns, 672; American Flag, 126; Uintah Treasure Hill, 20; Daly-Judge, 1,889; other mines, 1,208 tons.

The directors of the Lower Mammoth Mining Co.

operating in the Tintic mining district, have posted the second regular monthly dividend amounting to $9,500.

At a meeting of directors of the Newhouse Mines & Smelters Corporation to be held within the next month, the first dividend will be declared. It is believed that it will be 50 cents per share, or at the ratio of $2 per annum. It is the intention to build up a surplus and cancel the bonds of the company.

Mexico City.

The Smelting Business of Chihuahua.—The Rio Tinto Plant.—A Big Smelter at Chihuahua.—The San Toy Co.—Plans of the United States People.—Mining News From Parral.

In the State of Chihuahua the 250-ton smelting plant of the Rio Tinto mines at Terrazas, the resumption of which was made possible by the high price of copper, has been continuously in blast with excellent results since October last, shipping its product of about seven tons of copper matte daily to the Aguascalientes plant of the American Smelting & Refining Co. It is understood that when the latter company completes its plant near the city of Chihuahua, the Rio Tinto smelter will be closed down, as it will be more advantageous, with such a short railroad haul, to sell the ore to the A. S. & R. Co. than to continue to run the little plant at Terrazas. The Chihuahua smelter of the A. S. & R. Co., which is planned to be of 800 tons daily capacity, with room for enlargement, is being pushed toward completion; the principal buildings are almost all erected, and S. W. Eccles is quoted as saying that all will be ready for business in October of this year. That there is ore plenty for this plant is shown by the fact that the A. S. & R. Co.'s shipments from Chihuahua, even with the present shortage of railroad cars, amounted to between 400 and 500 tons per day, which could be greatly augmented if cars were available; besides, there is any amount of ore that cannot stand the freight to distant points, such as El Paso, Torreon, Velardeña, or Aguascalientes. When this Chihuahua plant was first started, the work proceeded in a rather desultory fashion, apparently with the idea of discouraging the building of smaller plants in the vicinity. This condition continued until the San Toy Mining Co., which had obtained large holdings in Santa Eulalia, began to talk of building a smelter at Chihuahua; then the A. S. & R. people waked up and hurried the erection of their own plant, and it is believed now that the San Toy company has abandoned the idea of entering the smelting business. This threatened competitor was no small affair, for though it is a company of but $6,000,000 nominal capital, its holdings in Santa Eulalia include the Juarez, Central, Septentrion, Peruana, Quien Sabe, Bustillos, and Galeana, and it is controlled by Charles M. Schwab and associates, whose millions would see a thing through once started, and who are not new to the smelting business. It well behooved the American Smelting & Refining Co. therefore to move. The San Toy company has just started the construction of an 8-kilometre railroad from Alberto (the A. S. & R. Co. smelter station on the Mexican Central), to connect with the aerial tram that brings the ore from its Santa Eulalia mines, a distance of four and one-half miles.

Map of Mexico.

The persistent rumors that the United States Smelting, Refining & Mining Co. was preparing to enter the smelting field of Mexico seem to be taking material form. The purchase by this company over a year ago of the Real del Monte, at Pachuca, cannot be looked upon as a part of the plans with the smelter idea in view, but it is known that some of the principals in the United States Co. are behind a certain ore-purchasing concern in Mexico City, which it is expected will act as agents if the smelter or smelters are erected. Within the last year also some consideration has been given to the plan of renting the San Rosalia (Chihuahua) plant of the Encinillas Mines, Ltd., but the English owners of the latter have not sense enough to see the wisdom of entering into such a scheme. The advisability of taking up a concession held by a Parral group of mining men for the erection of a smelter at Jimenez, Chihuahua, is likewise being

seriously considered. And within the past month it is understood, from a source that is usually looked upon as reliable, that the United States people have taken an option on, or closed a deal for, the purchase of the mines and railroad of the Naica Mining Co., of Naica, Chihuahua. This is one of the largest and richest mines in the State of Chihuahua, and could itself furnish sufficient lead ore for a good sized smelting plant. The figure at which the transaction is said to have been carried through is placed at $5,000,000 gold.

The Ricamole mine has recently opened up some good ore, and several shipments were made. This property, which lies in the Parral district, and close to the famous Palmilla, was denounced only a year ago. The workings consists of a 20-metre vertical shaft, with over 200 ft. of drifts and 100 ft. of cross-cuts. The vein is over nine metres wide, and during the development work they have taken out much high-grade ore, some running as high as six kilo. silver per ton. No machinery has so far been erected, as it is the intention of the owner, Leopoldo Iwonsky of Parral, to develop the mine first. The Mascota is now being worked with good results. This property lies in the northern part of the Minas Nuevas district. The vein is wide, being over 15 ft. The ore is silicious, the main value being in silver. The workings consists of three shafts, the deepest not over 20 metres. At the present time they are working only the south shaft. Mr. Garcia, the owner, states that he expects soon to begin shipping the ore which is taken out during development.

At the Palmar mine work is being pushed rapidly, and thus far consists of 130 metres of tunnel work, and two 100-ft. winzes. By this tunnel two veins have been cut, one five feet wide and the other 11 ft. wide. Both of these veins show good value in silver. The mine lies close to, and south of, the Palmilla, and is now being operated under the Palmar Mining Co. The main offices are in Chicago, and the work at the mine is under the management of Sr. Manuel Aguilera of Parral. It is the intention to equip the property for electric power in the near future. The officers of the company are D. W. Grubbs of Harrodsburg, Ky., president, Paul H. Seymour of Chicago, secretary, C. A. Bowton, treasurer.—— The Maria mine, one of the old and best known properties of the Roncesvalles district, is again being operated, after being closed down for over three years. This property is owned by Louis Phelan of Parral, and is at the present time shipping over 50 tons of ore per week, but this will be increased to 500 tons per month in the near future. The ore is a silver-manganese ore, containing also lead and gold. The average shipping ore will run 1,200 gm. silver, with five grams gold, per ton. The workings are now down to the 300-ft. level.

The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

1. Ætna	19. Tamarack
2. Empire	20. Osceola
3. Delaware	21. Tecumseh
4. Amygdaloid	22. Rhode Island
5. Copper Falls	23. Franklin, Jr
6. Central	24. Franklin
7. Phœnix	25. Arcadian
8. Cliff	26. Quincy
9. Mohawk	27. Isle Royale
10. Ahmeek	28. Atlantic
11. Allouez	29. Baltic
12. N. Kearsarge	30. Trimountain
13. Wolverine	31. Champion
14. Mayflower	32. Bell
15. Centennial	33. Adventure
16. Tamarack Jr	34. Mass
17. S. Kearsarge	35. Michigan
18. Calumet & Hecla	36. Victoria
	37. Winona

Calumet, Michigan.

Copper Mining in Ontonagon.—The Baltic Lode on the Lake Co.'s Property.—The Adventure's Prospects.—Mass Consolidated.—The Michigan and Its New Mill.—Good Work at the Victoria.

This promises to be a most active season in Ontonagon county. The discovery of what is supposed to be the Baltic lode on the property of the Lake Copper Co. has awakened a great deal of interest. The Lake company extracted several diamond-drill cores from the lode and most of these showed copper in encouraging quantity. It is the purpose of the company to start a shaft on the Baltic lode. The overburden at the site of the proposed shaft is only four or five feet thick and little difficulty is anticipated in getting the shaft down into the lode.

While the outlook at the Adventure is discouraging there is still some hope; the company is preparing for diamond-drilling near Peppered Junction, where it is hoped that the supposed Baltic lode will be found. The stand-pipe for encasing the drill has been sunk to a depth of 155 ft. without encountering solid rock. This indicates that the overburden is thicker than indicated by an earlier investigation. Work at the Adventure mine is now confined to No. 3 shaft, operations at No. 4 having been discontinued some time ago. About 30 drills are in use at No. 3 and the mine is employing a force of 325 men. During the spring some trouble was experienced because of the heavy inflow of water. The work underground in No. 3 is mostly in the openings east of the shaft. These go under a big depression in the surface, which is traversed by a small river, consequently the workings make a good deal of water. The company has striven for several years to make a successful mine in the old workings, but from present indications these efforts are doomed to failure. However, if a promising lode is revealed by the diamond-drill work, there will still be some hope. The company has a modern stamp-mill and mine equipment that could be readily utilized in the development and operation of any new workings on the supposed Baltic lode.

At the Mass Consolidated the outlook has improved and the mine is understood to be making a nice profit.

The new C shaft is furnishing more rock than either of the other two shafts. The management has installed an economical system for handling the rock at C shaft, something along lines not heretofore used in the Lake district and a big saving has resulted. Since the second stamp (formerly used by the Michigan) was remodeled, the production has been increased and every effort will be made to enlarge the ore shipments to the mill without lowering the quality.

Surveyors are now at work on the Riddle farm, owned by the Mass company, laying out lines for the diamond-drill work, which is intended to explore for the Baltic lode.

While the Michigan has not taken any steps toward finding the Baltic lode on its land, there is abundant evidence that the company has some prospects of getting this formation within its boundaries. The Michigan owns a large territory and the result of the explorations on the Mass Consolidated at Riddle farm will be awaited with keen interest. The Michigan is devoting attention to the development of its easterly opening, where the showing is encouraging. Ore shipments average about 550 tons daily, being forwarded to the Atlantic mining company's mill on Lake Superior. Work on the Michigan's new mill at Keweenaw Bay is progressing steadily and the Wisconsin Bridge & Iron Co. of Milwaukee, which has the contract for the structural iron, expects to complete its portion of the plant this month. The mill is to be completed by next fall, when a material increase in the production will be possible. The net earnings of the mine are expected to be sufficient to pay for the new mill and other improvements without any call upon the stockholders. At the Victoria there has been some increase in production as a result of the remodeled stamp being in use. The power-plant is working satisfactorily and the operating expeuses are low. The Victoria management is considering the advisability of starting diamond-drill work to find the Baltic lode on its property. A representative of the firm of Cole & McDonald, of Duluth, was at the mine recently to figure on the work.

Butte, Montana.

Earnings of the Mines.—Interesting Figures.—The Parrot Shaft.—Prospects in Depth.—Butte Exploration Suspends Work.—Butte & London.—Amazon-Butte Assessment.

The net earnings of the mines of Butte during the year ending June 1, 1907, were $20,000,000, an increase over the previous year of $2,611,273. In the annual statements of operations, filed with the County Assessor for the purpose of taxation on net earnings, the Boston & Montana, Anaconda, North Butte, Coalition, and Butte & Boston companies show material increases. Both the Trenton and Parrot companies show decreases, while the Washoe, as usual, shows a loss, as more than its earnings were spent in improvements at the Washoe smelter at Anaconda and at the mines. The Clark companies, and several minor operators, have yet to make their reports, but taking estimates for the missing reports, the figures are as follows:

Companies.	1906.	1907.	Increases.
Boston & Montana	$ 6,158,110	$ 7,049,988	$ 891,878
naconda	5,753,265	5,819,184	55,919
& Boston	1,075,890	1,249,467	173,577
rrot	277,015	141,730	*135,284
renton	541,530	481,623	*59,906
North Butte	1,848,010	3,271,213	1,423,203
Coalition	1,035,205	1,432,760	397,555
Clark mines	648,490	†650,000	2,000
La France	149,985	†200,000	50,015
Miscellaneous	2,195	†5,000	2,805
Total	$17,489,695	$20,100,968	$2,611,273

* Decrease. † Estimates.

The Washoe shows a loss, that is, expenditures in excess of receipts and earnings, of $266,973. The Pittsburgh & Montana also operated at a loss last year, and so did the Alice, as is shown by the latter's statement. The Pittsburgh & Montana Co. made no statement.

The Parrot Silver & Copper Co. has resumed sinking on the shaft of the Parrot mine, which is now down 1,875 ft. Work on the shaft was stopped some months ago, and was only resumed last week. For more than a year the Parrot has been working in the lean zone, through which all the big mines of the Amalgamated passed before encountering the zone of secondary enrichment. The richest ore in the Anaconda mine has been found on the 2,200 and 2,400-ft. levels, and the 1,800-ft. level of the Parrot is at about the same depth on the vein as the 2,100-ft. level of the Anaconda. Therefore, it is the belief that a few hundred feet will bring the Parrot to the orebodies opened in the lower workings of the Anaconda, both mines being on the same vein, the Parrot lying a short distance south and west of the Anaconda. The Parrot is mining about 400 to 450 tons of ore daily now, but it is not high-grade, the average being 60 lb. copper per ton. The company has also been doing development work on the Little Mina and expects to produce ore from that property before long. The shaft is 900 ft. deep and a cross-cut has been started toward the vein. H. A. Gallwey, who was added to the board of directors, is superintendent of the Parrot, and an exceptionally capable man.

There is talk of a possibility of a reorganization of the Pittsburgh & Montana Mining Co. The bonded and floating debts of the company are about as much as the property is worth, and the debt is constantly increasing. The company is earning from $60,000 to $65,000 per month, but the expenditures are said to be about $75,000 per month. It is claimed that the Pittsmont property has been badly managed, and the money of the stockholders frittered away in experiments on new-fangled smelting schemes. It is claimed that the development work underground was also done with poor judgment, and a lot of expensive work was uselessly duplicated in a number of instances. The present management of the company has been doing some intelligent development work, and while doing so it has attempted to make the mines pay the cost.——The Tuolumne Copper Co., which is developing a claim adjoining the Speculator, is cross-cutting north and south on the 600-ft. level, and has struck some fine copper-silver ore in the south cross-cut, about 50 ft. from the station. Sinking has also been resumed and the shaft will be carried to a depth of 1,000 ft. as speedily as possible. It was at that depth that the Speculator disclosed its big orebody.

The Butte Exploration Co. has pulled the pumps out of the Six O'Clock mine, which is taken as an indication that the company intends to abandon the property and permit the options to lapse. No information can be obtained by Butte stockholders. One option, on a claim called the Water Witch, has been permitted to lapse after the company had paid $1,200 on it. The officials live at Boston and Chicago, and the orders to pull the pumps came from them. The action caused a great deal of surprise and disappointment, especially among those who purchased stock under the impression that the company owned the property. It now develops that the company had only $150,000 with which to operate, although the promoters of the company are worth many millions. The $150,000 was derived from the sale of stock at $1.50 and $3 per share. The money did not go far in paying for exploration work, and when ore was not found, work was stopped.

The shaft of the Boston & Montana on the Greenleaf,

just south of the Six O'Clock, has reached a depth of more than 1,000 ft. A station has been finished and a pump is being installed. Sinking will be resumed during the coming week. The conditions of the Butte & London are different from those in the Six O'Clock, and the failure to find ore in the latter in no way affects the chances of the Butte & London. The Six O'Clock has to contend with what is known as the Continental fault, while the Butte & London is situated west of the fault.

The Amazon-Butte Copper company has notified its stockholders that at a recent meeting of the board of directors and "the largest stockholders" it was decided to make the stock assessable, and that an assessment of five cents per share has been levied, payable before June 23. The action of the directors was unknown to the small stockholders until the notice from the company was received. The company explains that it was decided to levy an assessment in order to continue development work, rather than sell treasury stock during the present dull market.

Joplin, Missouri.

High Prices for Zinc and Lead.—Large Production.—Five New Mills Started.—Transfers and Leases.—Several Strikes of Ore.—Drilling Operations.

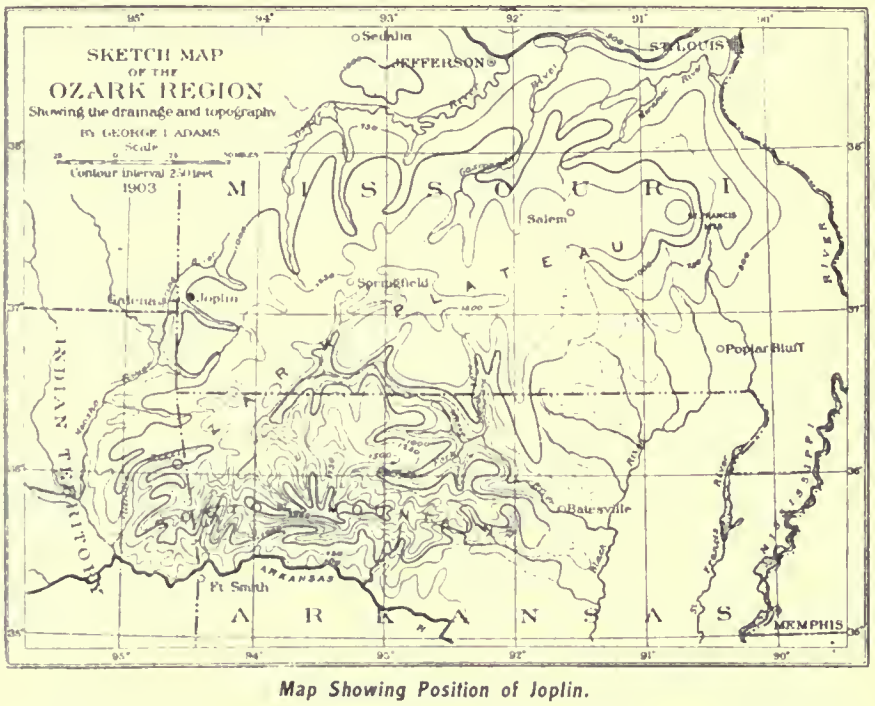
The high price of zinc ore for the past two months has been $50 to $51 per ton, the assay basis ranging from $45 to $47.50 per ton of 60% zinc. There has been but little change in the market. Lead ore has been selling for $82 to $83.50 per ton and holding very strong. A heavy rain on May 13 inundated the mines at Badger-Peacock, cutting off 300 tons per week, but five new mills in the Webb City-Duenweg portion of the district have made up that shortage, so the shipments have not suffered thereby.

	Zinc.		Lead.		Combined
Shipments.	Lb.	Value.	Lb.	Value.	Value.
Month of May.....	49,301,740	$1,138,153	8,064,600	$320,069	$1,458,222
Week of June 1...	12,183,420	275,476	2,150,990	87,237	362,713
22 weeks this year	266,428,940	6,266,673	42,069,870	1,721,610	7,988,283
" " last "	230,579,900	4,978,318	31,658,600	1,195,748	6,174,066
Increase.....	35,849,040	1,288,355	10,411,270	525,862	1,814,217

Last week marked the largest new production in the history of the district. Five new mills started in the vicinity of Webb City and Duenweg, and their production was close to 300 tons of ore. These mills are all modern in every respect and all of them have exceptionally rich material to work on, so that they are sure to enlarge their production in the next few weeks, or as soon as the 'new' wears off, as the saying goes. The new mills and their production was as follows: The Church-Mitchell, near Prosperity, 169,110 lb. of zinc; Luke & Ash, Prosperity, 107,420 lb. zinc and 7,750 lb. lead; Alabama, at Porto Rico, 101,480 lb. zinc; Rhea Lead & Zinc Co., Webb City, 61,070 lb. zinc; Hyde Park, near Duenweg, 35,860 lb. lead; Ice Plant Co., Webb City, 17,270 lb. lead. The Church-Mitchell had two cars of ore in the bin that could not be loaded and the Luke & Ash had one. The Big Three on the Marion B. lease started up the middle of the week but did not make a turn-in. These mills will add three to four hundred tons per week.

The Kramer Mining Co., operating north of Carl Junction, where they have a 300-acre lease, has purchased an undivided one-half interest in the 200-acre farm of J. W. Burgess, which adjoins their lease, the consideration being $25,000. This tract has been fully developed by drilling, nearly every hole showing the same run of ore, which was encountered at a depth of 175 ft. and continued to a depth of 225 ft. In sinking a shaft, the ground was found to be a sheet formation, more like the Webb City district than anything yet found in the Missouri-Kansas region. This company last week let the contract with F. W. Caulkins of Webb City for a 500-ton concentrating plant at a cost of $30,000.

The Lucky 8 Mining Co., operating on the old Allen Hardy farm northeast of Webb City, has made a second rich strike, the drill penetrating the ore for a distance of 30 ft. They have one shaft down in the ore.——The Sycamore Mining Co., of Joplin, has sold its property, consisting of a lease on 18 lots, on the south part of the Rex Mining & Smelting Co., east of Joplin, to W. H. Locker of St. Louis; the consideration is said to be about $100,000. Mr. Locker is the principal stockholder in the Quality Mining Co., whose land adjoins the lease just purchased. Developments will be pushed forthwith.—— The Rex Mining & Smelting Co., operating southeast of Joplin, and one of the largest producing companies in the district, is making arrangements to do some drilling. The company intends to drill to a depth of 600 ft. in several holes just to test the land for its deep mineral possibilities. The first hole will be put down north of the company's big mill. Other companies are also putting down some deep holes.



Map Showing Position of Joplin.

The Maggie Taylor mining tract, in the southeast corner of Galena, is now exhibiting a great amount of activity. This is caused by a number of rich strikes of ore at a deep level.——Articles of association have been filed by the Empire State Mining Association at Joplin. The capital stock of the company is $100,000, divided into 1,000 shares of the value of $100 each for a term of 50 years. The company has secured a lease of 10 acres on the Elliott & Zimmerman land just south of Webb City, and 40 acres on the Carter land north of Webb City, where they will commence drilling operations on a large scale. It is intended to drill about twelve holes on the leases and when the ground has been sufficiently tested a modern concentrating plant will be erected.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

CRIPPLE CREEK has produced $225,000,000 in gold, produced from workings, the maximum depth of which is 1200 feet.

THE explosion of nitro-glycerine is much sharper than that of gunpowder, because the oxygen in it is mixed with the combustible in a much more intimate way.

ON THE Yuba river dredging is done to a depth of 72 ft. below the water-line. This is the greatest depth to which dredging for gold has been carried successfully.

THE employment of copper sulphate to kill germs in drinking water has not found favor in New England. Tests made at Manila have also proved unsatisfactory.

NEITHER cyanide nor any other chemical is required for the ordinary dressing of the plates in a stamp-mill, provided sufficient amalgam is left on the plates after the clean-up. It is false economy to scrape the amalgam off the plates too closely.

AFTER gold has been dissolved in cyanide solution it is recovered by precipitation on zinc shaving, or it is precipitated by zinc dust, the resulting slime being melted with flux in a crucible. The bullion thus obtained is subsequently refined.

IN REGIONS where water is scarce and where copper mines are in operation, it may be estimated that 300 gal. water per ton of ore will be required. Of this amount, 240 gal. will be needed for power and treatment of the ore, and 60 gal. for domestic purposes.

DRILLING through gravel, preparatory to dredging, costs $2.50 per foot; the cost of shaft-sinking by the China method varies between 90c. and $1.50 to water-level, and below this the expense depends upon the influx of water and the consequent pumping.

THE imports of lead into Great Britain declined from 229,500 tons in 1905 to 208,200 tons in 1906, while the exports for the year fell from 60,500 tons to 58,400 tons. The consumption of lead in Great Britain showed a decrease of over 25,000 tons compared with 1905.

FOR dressing amalgamated plates, a solution of hydrochloric acid of 1.6% strength (or 1 in 20 when using commercial spirits of salt) makes a good substitute for the cyanide solution generally used. The cyanide dissolves gold and is a cause of loss in the water passing over the tables.

THE problem of the calculation of the pressures on ore-bin walls is the same as the problem of the calculation of pressures on retaining walls. The forces acting on bin walls depend upon the weight, angle of repose, moisture, etc., of the material, which are variable factors, but are less variable than for the filling of retaining walls. The graphic solution is the simplest and most direct for any particular case.

CONCRETE reinforced with steel or iron has been extensively used in retaining-wall construction. Retaining-walls of reinforced concrete may be built with a spreading base and a thin vertical section, or with a thin vertical section strengthened by buttresses or counterforts. Their principal advantage over a plain concrete wall is the saving of material in substituting a thin reinforced wall for the gravity section and in substituting earth filling on the back of the footing in place of expensive concrete.

EXPLOSIVES are made by obtaining oxygen in some concentrated form and mixing it with a combustible, so that the latter can be burned instantly, without the necessity of obtaining the oxygen for its combustion from a large quantity of air. The gases generated by the combustion and expanded by its heat, give the force to the explosion.

MOLYBDENUM is used for the same purposes as tungsten, but not so extensively, as it is harder to get in the pure state and is not as plentiful. It is used in steel making, but is more difficult to alloy with steel because of its liability to oxidize and volatilize. The chief ores are molybdenite and wulfenite. The present wholesale price of metallic molybdenum running from 98 to 99%, is about $1.75 per lb. f.o.b. works.

THE salt deposits of New Mexico thus far reported are in the shallow lake basins which are to be found in several places in the Territory. Probably the largest of these is in the west-central part of the Territory, 80 miles south of Gallup, on the main line of the Santa Fe railroad. The water contains about 26% of salts, mostly NaCl, and the supply is kept up by springs which are believed to rise from the Red Beds, which are usually salt-bearing.

IT IS undoubtedly true that in the manufacture of a high-speed tool steel the most satisfactory results will be obtained by using the best qualities of iron, which are free from impurities, and by using the highest grades of the various alloys and metals. In melting the steel and in adding the metal or alloy, care must be taken that the metals are thoroughly alloyed, and that the resulting alloy is homogeneous. The annealing process should also be carried out carefully, as this has a tendency to make the steel more uniform in regard to its molecular structure, relieving internal strains which may have been produced by casting and tilting.

WHEN silver plating is scraped off an amalgamated plate, either by wear or intentionally, the surface underneath is not as well fitted to receive a new coating of amalgam as a new copper plate that has never been electro-plated. The saving of gold is effected by the gold amalgam on the copper plate and a good coating of such amalgam is necessary to make the plate an efficient gold-saving device. It is more difficult to keep plain copper in condition than the silver-plated copper, but when both are in first-class order there is little to choose between them. In using electro-plated copper it is well to have it heavily plated, since a thick coating will last longer and tend to maintain a good amalgamating surface.

THE materials grouped under the head of mineral paints include such iron ores as are ground and used in the manufacture of metallic paints; ochres and other clays rich in iron, which are used for the yellow and brown pigments (ochre, umber, sienna), and which are occasionally roasted to give red pigments; and fine-grained slates and shales of attractive colors, which are ground for use as paints. Many other minerals or mineral products are used in the paint trade, such as graphite, chrome, whiting, talc, asbestos, and barite. Other paints, as venetian red, litharge, white lead, orange mineral, etc., are purely chemical products. Zinc white is made directly from the ore, without previous metallurgical processes.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Celebrated Case.

The Editor:

Sir—I have read with much interest the article by Mr. Hoyt appearing in your issue of June 1, and I desire to offer some comment.

The case of Lavagnino *v.* Uhlig was an adverse suit on behalf of Yes You Do claim against Uhlig No. 1 and Uhlig No. 2 claims, for which patent had been applied, the trial court excluded from evidence plaintiff's notice of location of the Yes You Do claim on the ground that the location was invalid because made by a Deputy U. S. Mineral Surveyor. Plaintiff then rested.

The defendants then proceeded to introduce evidence in support of the validity of Uhlig No. 1 and 2 mining claims; after which, in rebuttal, the plaintiff offered to show that the Levi P. and Veta mining claims, at the time of the location of Uhlig No. 1 and 2, were valid and subsisting claims and covered the discoveries of both Uhlig No. 1 and No. 2, and were then owned by Andrew P. Mayberry. Mr. Sonnedecker, an attorney of the plaintiff, offered the same "on behalf of the Government and as a friend of the Court." The Court sustained an objection to this evidence on the ground that no adverse claim had been filed on behalf of the Levi P. and Veta claims, and that plaintiff was no longer a party to the proceedings.

The Supreme Court of Utah, from whose statement of facts the above is quoted, after holding that the Yes You Do location was void, because made by a Deputy U. S. Mineral Surveyor, says:

"The failure of the plaintiff to show, in chief, any right to the premises in controversy, disclosed the fact that he was 'a stranger to the title' of the premises in dispute, and that a non-suit could, on motion, have been properly granted."

And also says that, even if the location of the Yes You Do claim had been made by one competent, an action on behalf of the Levi P. and Veta claims was barred by the statute of limitations, the Uhlig No. 1 and 2 having been held and possessed for eight years.

On appeal to the Supreme Court of the United States, 198 U. S., 443, the judgment was affirmed, though on different grounds. Mr. Justice White, who wrote the opinion, says, in overruling a motion to dismiss:

"It is evident from the record that the findings of the trial court as to the time when possession was taken of the Uhlig No. 1 and 2 claims, and the duration of possession, was based entirely upon the evidence introduced on behalf of the owners of those claims."

In the opinion, Mr. Justice Brown assumes

"For argument's sake, that the section of the Revised Statutes relied upon, and the rules and regulations of the Land Department, did not prohibit a Deputy Mineral Surveyor from making a location of mineral land;"

And concedes

"For the sake of argument, that the Levi P. location, of which the Yes You Do purported to be a re-location, was prior in date to the location of the Uhlig No. 1 and 2, and that there were areas in conflict between them. With all these concessions in mind the question yet remains whether Smith and his transferee, in virtue of the location of the Yes You Do, stood in such relation as to enable them, or either of them, to successfully adverse the application for patent made by the owners and possessors of the Uhlig locations."

He thus explicitly strips the case down to the following proposition:

"The question then is, where there was a conflict of boundaries between a senior and junior location, and the senior location has been forfeited, has the person who made the re-location of such forfeited claim the right, in adverse proceedings, to assail the title of the junior locator in respect to the conflict area which had previously existed between that location and the abandoned or forfeited claim?"

He then states the proposition somewhat differently, as follows:

"In other words, the proposition must come to this—that as the junior locator had acquired no right whatever, present or possible, by his prior location, as to the conflicting area, he would be obliged, in order to obtain a patent for such area, to initiate in respect thereto a new right, accompanied with a performance of those acts which the statute renders necessary to make a location of a mining claim."

And, evidently led astray by the proposition as he last puts it (which might or might not be true, according to circumstances), he decides his first proposition (which, in view of his concessions, was the question before the Court) in the negative.

The Supreme Court of Idaho, in Ambergris M. Co. *v.* Day, 85 Pac. 109, and the Supreme Court of Utah, in Farrell *v.* Lockhart, 86 Pac. 1077, express the hope that the Lavagnino case can be distinguished from the rule laid down in Belk *v.* Meagher, which has stood the test of time both in principle and practice.

That it will be distinguished there is little doubt, but no amount of legal differentiation will satisfactorily explain the Lavagnino opinion. The case must have been sharply debated by the justices, because Mr. Justice McKenna dissents, Mr. Justice Brewer concurs in the result, and Mr. Justice White goes out of his way to nail down and clinch his original proposition, to expressly state that Section 2326 qualifies Sections 2319 and 2324 to a greater extent than most lawyers concede, and to call the text-book writers to account.

Mr. Justice White makes the point that the contrary doctrine advanced by the text-book writers is founded upon cases decided "before the passage of the adverse claim statute of 1872, or concerned controversies between senior and junior locators, or depended upon the provisions of State statutes." None of the qualifications apply to Belk *v.* Meagher; and, furthermore, the adverse claim statutes of 1866 are, in effect, the same as those of 1872. 'Lindley on Mines,' pp. 1627 and 1628.

But, it would seem, the Supreme Court of the United States, in the case of Brown *v.* Gurney, 201 U. S. 184, has restored the doctrine of Belk *v.* Meagher, in so far as the same had been weakened by Mr. Justice White's handling of the Lavagnino case; without, however, mentioning the Lavagnino case, though that case was cited on the brief of attorneys for plaintiff in error.

Mr. Chief Justice Fuller, who writes the opinion, which is a unanimous one, emphasizes the principle:

"Of course it is essential that at the date of a location the ground located on should be part of the public domain, and in the present case the specific question affirmatively raised was whether the ground in controversy was a part of the public domain at the time of the respective contested locations."

And says further:

"The election, then, by the Kohnyo claimant, filed in the Land Office June 14, 1898, was an abandonment of the south seven hundred feet of the Kohnyo claim, which took effect *eo instanti* Lindley, pp. 642, 643, 644; Derry *v.* Ross, 5 Colorado, 295, 300. This was voluntarily done, and took effect notwithstanding the Receiver's receipt had not been formally cancelled. The order of cancellation of July 15 simply recorded a pre-existing fact, and did not change the effect of the previous abandonment. By reason of that abandonment the southerly tract, for the first time, reverted to and became a part of the public domain. And as the Hobson's Choice was the first location of the ground made after such abandon-

ment, it follows that it was valid, and that its owner was entitled to a decision in its favor.

"We again state the dates of the respective locations. The Scorpion was located May 13, 1898. The Hobson's Choice was located June 23, 1898. The location of the P. G. was July 16. Thus it is seen that the Scorpion was attempted to be located at a time when the premises were not subject to location; that the Hobson's Choice was located when the premises had reverted to the public domain; and that the location of the P. G. was after that date."

The Chief Justice also makes the point that "the discovery shaft of the Scorpion was upon ground covered by the Kohnyo's claim." This latter fact existed in the Lavagnino case, and was mentioned by the Supreme Court of Utah in its statement of facts, and the point was made on the brief of attorneys for plaintiff in error, but was not referred to by Mr. Justice White; it must have been considered, though, under the rule as laid down by him, it would be immaterial whether or not the discovery was involved.

The Supreme Court of Utah, in the late case of Lockhart *v.* Farrell, 86 Pac. Rep. 1077, wherein the same question was involved, relies largely upon the fact that Farrell's discovery was made upon the South Mountain claim, which, at the time, had not been forfeited.

The facts in this case are as follows: The South Mountain was located August 21, 1900; the Cliff, Farrell's claim, on August 1, 1901; and the Divide, plaintiff's claim, January 2, 1903; all covering the same fraction. The Cliff applied for patent and was adversed with the Divide; no adverse was filed for South Mountain, which was forfeited January 1, 1902, for failure to perform annual labor. The trial court held, under the doctrine of the Lavagnino case, that plaintiff was not entitled to prove that at the time the Cliff was located the ground was held by the South Mountain location. The Supreme Court reversed the lower court and ordered judgment entered for plaintiff. The Supreme Court distinguishes the Lavagnino case, and follows the case of Brown *v.* Gurney, saying, in conclusion:

"Giving the Lavagnino case the construction contended for by the respondent is, in effect, to make it overrule Belk *v.* Meagher, and Gwillim *v.* Donnellan, and to render it in conflict with the decisions of both Federal and State courts on the question. We do not believe any such result was intended by that decision. Likewise to give it the meaning contended for renders it in conflict with the more recent decision of Brown *v.* Gurney. Whatever room there may be for the contentions (Ambergris Min. Co. *v.* Day, Idaho, 85 Pac. 109, and Wilson *v.* Freeman, 68 L. R. A., 842, note 5), that the Lavagnino case is in conflict with or distinguishable from prior decisions, it is sufficient for us that we follow Brown *v.* Gurney more recently decided, and which more nearly applies to the facts of the case at bar."

Farrell *v.* Lockhart has been appealed to the Supreme Court of the United States, and, if affirmed there, as may be expected in view of Brown *v.* Gurney, the air will be clear again.

Mr. Dey, who was of counsel for appellant in the Lavagnino case, is now appealing the Farrell case to the Supreme Court of the United States. He contends that the Farrell case is on all fours with the Lavagnino case, and that the Supreme Court of Utah misconceived the principle involved in Brown *v.* Gurney. He distinguishes Brown *v.* Gurney on the ground that at the time the Scorpion location was made the land could not for any purpose be deemed a part of the public domain, having been withdrawn by the issuance of the receiver's receipt for the Kohnyo; that, therefore, it was no more subject to location than if patent had been issued, and that fact could be shown by a later locator.

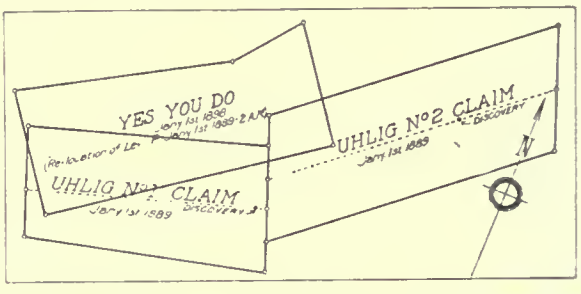
Chief Justice Fuller says in Brown *v.* Gurney:

"Of course, it is essential that at the date of location the ground located should be a part of the public domain;"

and also says that the "specific question affirmatively raised" by that case "was whether the ground in controversy was a part of the public domain at the time of the respective contested locations."

Now the question whether the ground in controversy was part of the public domain was affirmatively raised in the Lavagnino case, in the same manner as in Brown *v.* Gurney, if we accept the premises of Mr. Justice White.

In Brown *v.* Gurney, the ground was under location as the Kohnyo (owned by Cripple Creek Mining Co.), on May 13, 1898, when Brown located the Scorpion; on June 14, 1898, the Cripple Creek Mining Co. filed in the land-office an abandonment of that portion of the Kohnyo, and on June 23, 1898, Gurney located it as the Hobson's Choice. The Scorpion applied for patent and the Hobson's Choice adversed; the Kohnyo claimant did not appear. The issue was thus raised as to whether the ground was open to location on May 13, 1898; but, under the Lavagnino doctrine, how could the claimant of the Hobson's Choice be allowed to prove that on May 13, 1898, the ground was not a part of the public domain? Relatively, the Kohnyo occupied the position of the Levi P., and, since the Kohnyo did not adverse the Scorpion, "the conclusive presumption" was in favor of the latter; the Hobson's Choice being in the position



of the Yes You Do, and therefore not permitted to prove that, when the Scorpion was located, the ground was held by a senior valid location. The fact that a receiver's receipt had been issued to the Kohnyo is not material; the receipt was shortly afterward cancelled, the books of the land-office were clear, and neither the Kohnyo nor the Government had any interest in the controversy. Furthermore, it was the Kohnyo claimant's act of abandonment which left part of that claim open to location, not the cancellation, which took place after the Hobson's Choice had been located.

In the language of the Chief Justice:

"By reason of that abandonment the southerly tract, for the first time, reverted to and became a part of the public domain."

If "it is essential that at the date of location the ground located on should be a part of the public domain," why should not an adverse claimant, like Lockhart in the Farrell case, be allowed to show that at the time the Cliff location was made, the ground was not a part of the public domain, because covered by a valid location, just as he would be allowed to prove that the Cliff locator never made a discovery, or failed to mark his boundaries, or to record his notice of location?

Under the United States statutes, it is just as essential to a valid location that the land located belong "to the United States" (Sec. 2319), or be "situated on the public domain" (Sec. 2321), as that a discovery be made (Sec. 2320), or that the location "be distinctly marked on the ground so that its boundaries can be readily traced" (Sec. 2324).

Sec. 2324, after prescribing how a mining claim shall

be located and the amount of annual labor to be performed, says:

"And, upon a failure to comply with these conditions, the claim * * * shall be opened to re-location in the same manner as if no location of the same had ever been made." *Expressio unius exclusio alterius.*

It must be conceded that Sections 2325 and 2326, which treat of adverse claims, do qualify the above-mentioned statutes to a considerable extent. Section 2325 provides that:

"If no adverse claim shall have been filed within * * * the 60 days of publication, it shall be assumed that the applicant is entitled to a patent, * * * and that no adverse claim exists;"

which was construed in Wright *v.* Dubois, 21 Fed. Rep. 693 (Brewer, J.), to mean that

"If no adverse claims are presented it is conclusively presumed that none exist, and that no third parties have any rights or equities in the land."

Sec. 2326 provides that the failure of an adverse claimant to bring action within thirty days after filing his adverse claim, "shall be a waiver of his adverse claim;" which, with the preceding section, has been construed as qualifying the other statutes to the extent that one having a *prior valid location* will be deemed to have voluntarily waived his rights by failing to adverse. Seymour *v.* Fisher, 27 Pac. Rep. 240 (Colo.).

And these and other decisions seem to justify the statement of Mr. Justice White that Sec. 2326 thus clearly provides:

"That if there be a senior locator possessed of paramount rights * * * he may abandon such rights and cause them in effect to enure to the benefit of the applicant for a patent by failure to adverse, or, after adversing, by failure to prosecute such adverse."

But neither the statutes nor the decisions warrant the further deduction of the Lavagnino case, that the rights of a senior locator enure on abandonment or forfeiture, to a junior whose location was made at a time when the senior was a valid claim, *in a case where an adverse claim is filed and prosecuted by a third locator.*

Where an adverse claim *has* been filed and suit brought, there are no presumptions in favor of the applicant for patent; such as are absolutely necessary in order to clear title where no adverse is filed; or, if filed, is not prosecuted. In the language of Chief Justice Fuller, in Brown *v.* Gurney:

"In adverse proceedings each party is practically plaintiff, and must show his title."

In my opinion, therefore, Mr. Justice White's proposition should have been answered in the affirmative:

"The question then is, where there was a conflict of boundaries between a senior and junior location, and the senior location has been forfeited, has the person who made the re-location of such forfeited claim the right, in adverse proceedings, to assail the title of the junior locator in respect to the conflict area which had previously existed between that location and the abandoned or forfeited claim?"

GRANT H. SMITH.

Salt Lake, June 1.

Black Sands.

The Editor:

Sir—I came across a number of your journal recently in which you score a Mr. Day for misrepresenting the facts regarding the yield of gold and steel from black sand. I know nothing of Mr. Day, and shall say nothing about the gold, excepting that assays of black sand show much larger results than can be obtained from any process yet discovered. If a practical process could be invented for saving the gold, I think that great fortunes could be made on the sea coast of the State of Washington.

Thirty-five years ago E. F. Russell of San Francisco invented a process for saving the gold from black sand. He worked near the Cliff House on sand obtained there. He was an ingenious man, and, after he had been working some time trying to save the gold by a quicksilver process, the idea occurred to him that he might smelt the sand and afterward separate the gold from the iron. He failed to do so, but he did succeed in producing a fine quality of steel, some experts declaring it to be the finest known to commerce. The article was peculiar. It could be whittled almost like lead, but struck with a hard substance it gave out a clear bell-like sound. The Mechanics Institute had two razors made from this steel that were pronounced of superior quality. At the navy yard at Benicia a bell was cast from some of the same metal with results of the most gratifying nature. A manufacturer of pianos in the East, while on a visit to San Francisco saw some of this metal and pronounced it eminently fit for the manufacture of piano strings. Russell was a regular Col. Sellers in many respects, and had many schemes on hand. He died several years ago.

I know personally that the finest steel can be made from the black sand, and know that there is abundance of this sand in the ocean beach of the State of Washington, but know nothing of the matter commercially, and give the above information for what is worth.

C. P. FERRY.

Tacoma, April 30.

Insufficient Postage.

The Editor:

Sir—You will be conferring a great favor upon many English engineers and others if you will draw the attention of your readers to the frequent troubles caused us by the receipt of insufficiently stamped letters from the United States. As many of such letters only contain advertising matter, we have been compelled to adopt the custom of refusing to accept and pay the fines on all under-stamped letters unless the envelopes indicate that they are from friends.

It is impossible for us to understand why Americans should be so pre-eminently ignorant on postal matters.

HOOPER & SPEAK.

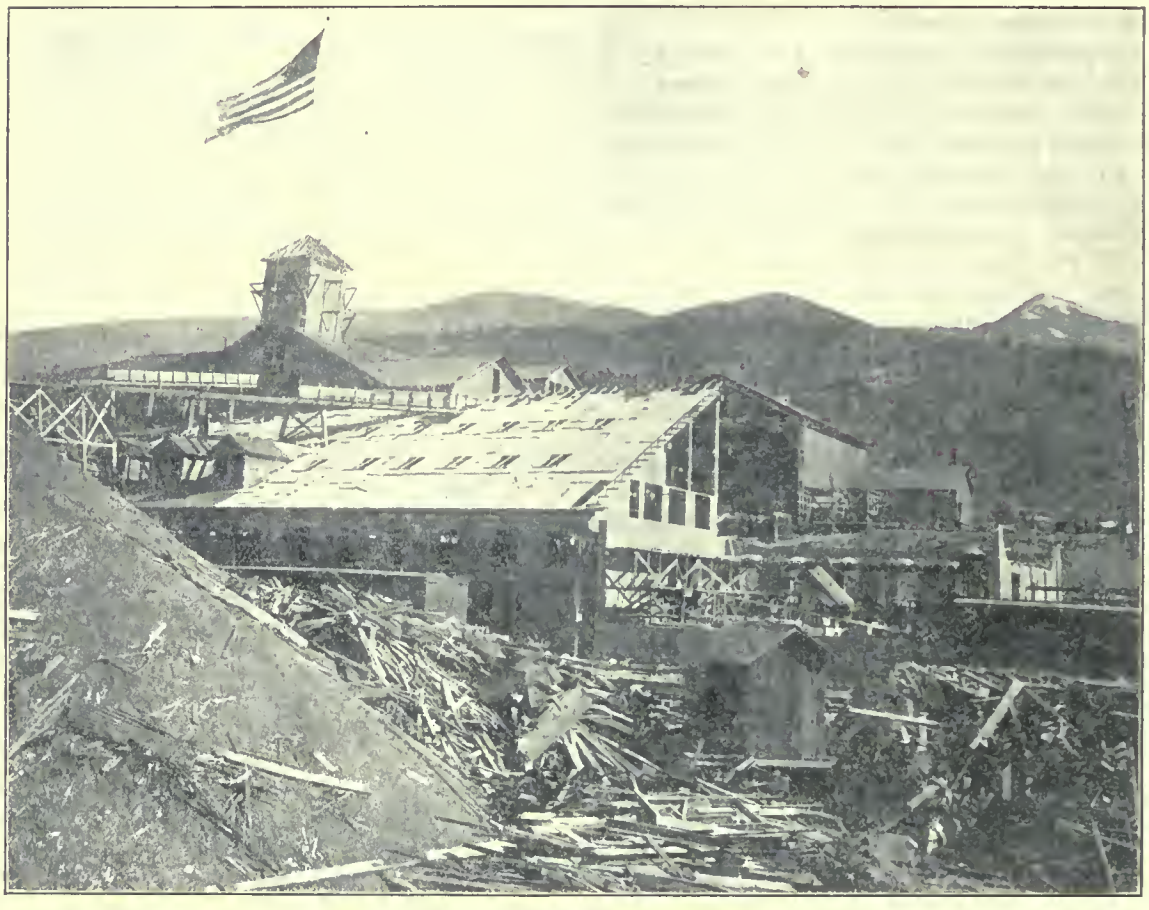
London, May 24.

SWISS ELECTRIC ENTERPRISE.—The Swiss hydro-electric enterprise of the Lake of Brusio, in the Canton of the Grisons, the machines of which were first set in motion on March 10, is without doubt the most important upon the Continent. The water of the Poschiavo river is caught at the base of Lake Poschiavo, which is used as a controller or regulator for the reservoir and conducted by a 3-mile conduit into the reservoir 1,378 ft. above the central station. From this reservoir the water is brought into the hydraulic station by means of five conduits fastened in the craggy rocks to a nearly vertical wall. The station now contains six groups of dynamos with, respectively, a force of 3,000 h.p. each. During this year there will be added four new groups, and in 1908 the two last, which will complete the installation and thereby enable the station to produce an energy of 36,000 h.p. A portion of this will serve to the needs of the Valley of Poschiavo and for the future electric railway of the Bernina. The contractors will reserve for themselves 16,000 k.w., and this power will be distributed in the industrial region south of the lakes of Como and Majeur by the means of a cable 100 miles in length. This great undertaking is the property of a Swiss company, and its installations are due entirely to Swiss industry.

The Troubles in the Coeur d'Alene.

The bloody atrocities perpetrated in northwestern Idaho from 1892 to 1900 are usually referred to as 'troubles,' the cynical humor of the term being emphasized by the accompanying photographs illustrating the destruction of the Bunker Hill & Sullivan Mining Co.'s mill. How this was done, has been told lately on the witness stand by Harry Orchard, a self-confessed murderer and assassin. According to his story, he himself lit one of the fuses that exploded eighty boxes (50 lb. each) of dynamite, destroying the concentrating mill with a roar that was heard twenty miles away. This was on April 29, 1899. The president of the Bunker Hill & Sullivan Mining & Concentrating Co. was (and is still) Frederick W. Bradley, a mining engineer of whom it is no formal compliment to say that he is one of the foremost men in an honorable profession; the manager at that time was Frederick Burbidge; the superintendent was Albert Burch, and the mill-boss was Edward Herrin. Mr. Burch is now at Boise, having been subpœnaed as a witness. Mr. Bradley himself was the victim of a dastardly attempt on his life, although this happened several years after the events recorded above. On November 17, 1904, at 7:40 in the morning, Mr. Bradley was about to leave the apartments at 1404 Washington St., San Francisco, when a bomb, placed there by Orchard, exploded beneath him. He first noticed that his cigar, which he had just lit, flared suddenly, so as to suggest a practical joke. Then, as he opened the door, there was a deafening explosion and a moment later he was hurled into the street. The occurrence was believed to have been an accident, due to a gas explosion, and the owner of the building brought suit against the San Francisco Gas & Electric Co., getting a verdict for $11,000—all that he asked. Now, however, it is stated by Orchard that it was nothing less than an attempt to kill Bradley, that Orchard had shadowed Bradley for weeks until he knew his regular habits and so was able to time the explosion of his bomb. Mr. Bradley was nearly killed and was expected to be either blind or deaf, but, most fortunately, he has recovered from the effects and is himself again.

In regard to the destruction of the mill, this was the culmination of a long quarrel between the management and the outside labor-unions (but not with its own employees), the company having steadily refused to recognize the union after the disorders and murders that occurred in 1892 and the years succeeding. In 1899 the Bunker Hill company was paying lower wages than the other companies in the district, although this was largely balanced by the fact that it had a dry mine, entered by an adit. Furthermore, this company had maintained then (as now) the distinction between skilled and unskilled workmen. The staff had always consisted of fearless men and the mine was big enough to warrant the retention of a number of engineers and millmen of high character, so that the representatives of the Bunker Hill & Sullivan had aroused the hatred of the unruly elements in the labor organization. On April 25 the company raised the scale of wages to that obtaining at the other mines but declined to recognize the union, even going so far as to discharge the few union men then in its employ. In consequence, when deviltry was afoot, the first object of it was the big mill at Kellogg. To give an idea of the condition of local government, it may be mentioned that the sheriff came to the superintendent and told him that he (the superintendent) would not be allowed to 'interfere' with any men that wanted to come to the concentrator and that he (the sheriff) could not protect the property. This was just before the mob took forcible possession of a train and came down from Burke with the purpose of killing the superin-



Bunker Hill & Sullivan Mill After the Explosion.

tendent and destroying the mill. The sheriff came with the mob. There were about 1,000 men on the train, led by half a dozen desperadoes. One third of them were masked and armed with rifles or revolvers. The superintendent was advised by telegraph and closed down the mill and mine. The train arrived at Kellogg at one o'clock, and within an hour and a half the two tons of dynamite were put in place and exploded. The other office buildings and the manager's residence were set on fire and destroyed. John Schmidt, who, with others, was sent up the hill to reconnoitre, was shot and killed by men on his own side, whether purposely or accidentally, is not known. All of the company's employees escaped, except three, namely, James Cheyne, a millman, R. R. Rogers, the stenographer, and William Huff, the assayer. They were subjected to gross indignities and then told to run; as soon as they started they were shot at, in Mexican fashion. Rogers was hit as he was climbing a fence, but survived. Cheyne fell in a hail of bullets and was rescued by Mrs. Ida Sinclair, only to die in a hospital at Spokane three days later. Huff jumped into the river and escaped. He is still working for the company. The mob returned on the train to Wallace at four o'clock that day and the other mines resumed work that night. Governor Steunenberg promptly appealed to President McKinley for troops, the State militia being then in the Phillipines. The rest of the story is pretty well known, and it need not be repeated. It is symbolized by the United States flag that flies from the top of the mill and flutters over the ruins, as shown in the accompanying photographs. The mill cost $250,000. It was promptly rebuilt and at the same time the company rebuilt the schoolhouse (at a cost of $10,000) and presented it to the community. Finally it may be noted that the employees whom the mob intended to deprive of their livelihood in Idaho are still pursuing their avocations with the Bunker Hill & Sullivan Mining & Concentrating Company.

Destruction by Dynamite Explosion.

BRAZILIAN CARBON SHIPMENTS.—There are many firms in Bahia, engaged in the business of purchasing carbons. These are either branches of French houses or they ship to firms in London and Paris on joint account, all the carbons bought here being thus shipped. Carbons are not brought to Bahia for sale, but are bought in the interior of Brazil by agents of the dealers, the latter advancing to the former large amounts of money at the several places in the producing districts. There are no companies engaged in mining or searching for carbons, that work being done by the natives, individually or in small parties working together. Prices are not controlled by any trust, but are governed by supply and demand and are subject to frequent changes. The carbon region begins about 267 miles from Bahia, and can be reached in four days, namely: Bahia to Cachoera, 45 miles by water, one day; Cachoera, to Bandeira de Mello, 158 miles by rail, one day; thence to Andarahy, 61 miles, on mule back, two days. There is a monthly steamer service between New York and Bahia, but between Bahia and British ports there are several steamers each week. Very little English is spoken in Bahia, and in the interior none but Portuguese is spoken. Owing to the facilities with which carbons can be smuggled out of the country, exporters are compelled to pay a tax for doing business, as follows: Firms exporting up to $150,000 annually, $1,500; exporting above $150,000, $3,000. In addition to this tax there is an export duty of 7% ad valorem.

THE Muho and Kuanying Shan gold mines in Heilungkiang, which have been restored to China by Russia on the repayment of the expenses incurred by the latter during the last several years, are said to be still rich, and may be again made prosperous if sufficient funds are put into the working of them. Owing to the threatened attitude of the large number of Hunghutze in the vicinity of Muho and Kuanying Shan, the mines are now guarded.

The Engineer and the Age.

By FRANK E. SHEPARD.

*The graduating engineer of twenty years ago little realized that in this time he would witness the practical application of such inventions as the electric street-railway, wireless telegraph, electric mine-haulage, hoisting and pumping, magnetic separation of ores, and similar wonderful developments, yet many of these great subjects were treated in '87 as interesting laboratory experiments, but hardly considered as practical successes. Many textbooks of '87 are today obsolete, the chemistry of twenty years ago tabulated 15 non-metallic and 49 metallic elements, today you have a knowledge of 78 elements. The contemplation of such remarkable changes may suggest to you the possible problems and the great opportunities to be offered in your own career.

Our honored Professor of History once stated: "Young gentlemen, I am aware that as students in engineering subjects, you have little time for my course, and I cannot expect to teach you much history, but I wish to teach you how to study history." Is this not the keynote of a technical education? We cannot expect in three or four years to become engineers, but we can establish systems that shall, in good time, make us engineers.

The stern discipline of the New England district school placed great value on the training of geometry. Some pupils would master the *principle* of the theorem, while others would commit to memory the sequence of letters relating to angles and lines, and sad would be the result for the memory students after the master used the alphabet in a different order. As engineers, it is essential that we should know the *principle*, rather than the sequence of the letters in our textbooks. Your laboratory experiments follow certain defined schemes, but practical work of one or two years may develop systems that are more direct. It is this special work that brings out the details so important in technical development. Persistent effort in one direction has accomplished great results, for example, the incandescent lamp and the phonograph mark the success attending the untiring energy of Edison. Westinghouse and his automatic air-brake have saved thousands of lives; MacArthur and Forrest in their cyanide process have created millions of wealth, and what could be accomplished in this age of steel without the bessemer and open-hearth processes? Pioneer explorations have opened the way for vast empires, pioneer thoughts have changed the methods of a world.

And now with all the strength from the training you have received, with the equipment of modern thought and apparatus, what will be the share each one of you will contribute to the strenuous progress of today? How can you bring yourself to the best efficiency and what will be your attitude in your profession and its relations to commercial life?

Only a few years ago all engineers were divided into two classes, military and civil; now there are dozens of divisions, and scores of sub-divisions, each branch of industry requiring the attention of its specially trained men. Formerly the idea prevailed that the engineer should devote his entire attention to matters of technical detail, while financial responsibilities were delegated to the business men. Today the schedule of studies in the technical schools shows careful attention to works-management and the most economical handling of financial questions in great installations. Not only must you be able to design your work, but you must install your plant with the least possible outlay for the greatest efficiency. We may wonder that the technical man, while studying through a microscope of small details, is able to adjust his vision to the telescope of broader views, but such is possible, as is demonstrated by the success attending the administration of some of our largest works and enterprises. Three words may define the terms of success for the engineer of the day: Truth, System, Energy.

Truth is the basis for all technical investigations, for the elements of structural soundness, and for the development of practical results. From the elementary beginnings of the class-room to the intricate details of the finished work, we must follow the straight line of truth. In your own chosen profession of the mining engineer, the man who will examine the mine after the most thorough methods, conscientiously select and care for his samples from beginning to end, study plans for development with regard to every possible outcome, and report *the truth*, this is the engineer that will finally command respect and favor. Under the stress of competition, the desire may come to present mining prospects in a more favorable light than your honest investigation may permit. Better condemn a thousand properties at the expense of being called too conservative, than favor the expenditure of one penny through the recommendations of a highly colored report.

The true mining engineer will not offer a professional report on any property or process in which he has a personal or financial interest. When he leaves the limits of his profession and deals in shares of stock on which he may have private knowledge, he brings disgrace upon the profession, and he should suffer the penalty of being deprived of his degree. Do not bring discredit upon this splendid profession by dabbling in stocks. Modern business, in the effort to facilitate the exchange of goods, offers a commission to proper agents as a compensation for time and attention, and when conducted in accordance under recognized rules, this bonus serves as a stimulant to trade, but when the professional engineer, in addition to his salary or fee, expects a commission on the purchase or sale of property, plants, or processes, he dishonors his profession and disqualifies himself as a disinterested advisor. Associate yourselves with worthy enterprises, give an impulse to sound developments, proclaim all that is good, denounce fearlessly every bad feature, and do your share to raise the mining industry to high standards of honor and confidence.

Next comes system. The great power from knowledge of facts comes from their systematic classification in notes, or the ability to find the authority. At this moment your impression is that you will never forget the formula you now recite so promptly. The test will come in ten years from now, and fortunate is he who has written his notes for a correct translation. The memory training of the class-room is a fine accomplishment, but let me warn you, you must begin now the system of keeping legible and comprehensive notes, if you are to follow the amazing pace of technical changes.

Among the books acquired in my student days are volumes that are now obsolete; one of our professors stated to me a few weeks ago that he was to deliver that morning a lecture on a subject not known at the time our class attended his lectures. Keep always the textbooks you now have, for they will be most familiar to you, and you know their arrangement better than that of a new edition. Begin now to accumulate a library in your own line of work and keep thoroughly up-to-date in latest editions of standard works. Technical books are expensive and you will appreciate the value of partial payments when you are on the payroll.

It is absolutely necessary to be familiar with the technical periodicals of the age if you wish to be thoroughly

*Address delivered to the class graduating from the State School of Mines, Colorado.

posted on the latest developments in technical matters. A work may be ever so complete, but unfortunately many are out-of-date by the time the second edition is issued. The very things we wish to know in our daily practice are to be found usually in the weekly journal of our particular line of work, and the data are often furnished by the man on the ground, who gives us the screen-mesh, the wire-number, the revolutions of a pulley, or the strength of a solution; and here let me urge all who may have the opportunity, to give freely from the data obtained in your own work. The age of mysterious trade-secrets is fast disappearing and you may have the privilege of contributing some thought, some result that will make a better system or a better plant. The preparation of a paper often carries with it a deeper investigation of the subject and leaves you with a better grasp of the particular details.

Societies like the American Society of Mechanical Engineers, and the American Institute of Mining Engineers, publish transactions of great value and here is a rare opportunity for the graduate. Many of these societies allow the graduates of technical schools to assume the grade of junior member or associate, and it is wise to enroll as early as possible in order that you may obtain the use of these fine volumes. In them you get a record of the day's work from the specialist.

The various handbooks are excellent for reference and save much time in the search for bits of information. Trade catalogues often contain excellent data for practical service, as such information is collected and verified by the tests of a specialist. The increasing tendency to publish approximate dimensions and weights of machinery is to be commended, and in good time the manufacturer who offers such information will obtain the confidence of the engineering profession.

In your profession the keeping of notes is most important. For the field-notes, the mine-examinations, the records of chemical analysis, and like branches, there are certain well planned forms, but the vexing question is: "What form of notebook shall we use for the general practice?" After suffering the remorse of one who has seen the passing in review of various sizes of notes, from the folio to a vest-pocket edition, let me urge you to decide upon some standard size of notebook, which in years to come will look down upon you from your shelves in well-regulated ranks, instead of the motley forms of an awkward squad. Today the best form of note is found in the loose-leaf system, consisting of a leaf 4 by 7 inches, perforated and punched to allow filing in some permanent binder under its proper subject. Such a system includes the bound and perforated blanks to be obtained in dozen lots or more, the pocket case for holding a few leaves and miscellaneous data, and the binder. Please allow me at this point, to make a plea for some standard size of notebook for use in the work of *this* school. A conference between professors and instructors will accomplish much, and if not one size, then adopt a set of standard dimensions to be followed throughout the courses, thus providing the student with a convenient and symmetrical reference system. If during the first year there could be arranged a suitable course of instruction in the keeping of notes and data, the results to the practical engineer would be far more valuable than lofty flights in quarternions or methods of least squares.

The best system for library or office reference is the card-index, which may be used in various convenient forms; it admits of re-arrangement and is capable of being maintained up-to-date. This card-system serves well for indexing drawings, tabulations of accounts, cost reports, inventory of stock and, if well planned, becomes one of the most useful means of reference in an office. A habit to be earnestly commended is that of noting on index-cards, any important article or note, and filing it under a proper classification. When the technical magazine or book arrives, make it a practice to look over the articles carefully and write your card-reference for prompt filing; delay spoils the system.

Do not attempt any laborious or ornamental printing on these index-cards, for this requires too much time. Write in a legible hand, making such notations that you will understand them ten years from now. A valuable device for assisting in the work of office or field computations is found in the slide-rule. A surprising amount of time is saved in tabular or similar work, and it is a safe check on complicated estimates. The only way to master the instrument is to live with it day after day, and in time you will distance the man with the pencil and paper. Special computing scales are made with great refinement for rapid calculations of the most complex problems. Such advice may be a shock to your worthy professors, who have labored faithfully to instill into your minds the principles of certain mathematical equations, which in themselves are a necessary discipline, but the stress of the age requires the use of such expedients, and with their aid you will be saved many a weary hour.

In connection with your laboratory and field experiments you have found the value of section paper for plotting results. The diagram is also a useful means of displaying visually the variation in office accounts or the records of works. The daily output of the mine, the relation of wages or material to revenue, the ratio of non-productive to productive labor, all may be more clearly shown by a glance at the diagram than by hours of poring over tabular forms.

The best evidence that the engineer of the mine, smelter, or mill, employs system in his work, is in the form and manner in which he presents his requirements for machinery or material to the manufacturer or supply house. A poor sketch is better than none, and a list on a sample shingle may indicate your requirements, but the engineer who states *clearly* the problem he has to solve, and specifies in sufficient detail the list of material for the work in hand, is the one who inspires interest in the sales department. When the manufacturer receives a letter from a party requesting detailed estimates and specification for a 10, 20, 50, and 100-stamp mill, he sends the possible customer an estimate on a 10-stamp mill; and usually the incident is closed. When you ask for tenders on a smelter plant complete in all respects, with plans and specifications, do not forget to state whether the ore comes from Joplin or Jimtown. One of the puzzling questions to the manufacturer is the general tendency among works-superintendents to fail in keeping a sufficient supply of extra parts on hand, ready for the emergency. An extra crusher-jaw, or a spare roll-shell does not require a great expenditure and a few days delay in the mill's operation may mean thousands of dollars. We may derive wisdom from the old lady's proverb: "'Tis better to be ready and not go, than to go and not be ready."

To determine the cost of an operation or an installation, is not as simple as it may appear. One of the first tasks to which the constructing engineer should apply himself, is the determination of costs for the various departments of the organization. Fixed expenses, such as rent, insurance, taxes, salaries, also wages of non-producers, bear an important part in the success or failure of an undertaking, and require constant watching with an endless amount of planning.

In mining, smelting, or milling systems, the greatest revenues are derived by maintaining the plants or processes in successful operation day after day, and the great factors in producing these results are found in sound

materials and best possible designs in mill and machinery. Study the most successful plants of your mining country and you will find the best machinery that money can buy. The call is not how cheap, but how perfect. However simple the installation, build as well as you know how, use the best materials, adopt generous dimensions and the additional expense will soon be made up in long and continuous service.

Put your own soul into your work, insist on true and sound construction, whether above or below ground, and when your structure is complete it shall be said, as in 'The Building of the Ship':

> "We know what Master laid thy keel
> What Workmen wrought thy ribs of steel,
> Who made each mast, and sail, and rope,
> What anvils rang, what hammers beat,
> In what a forge and what a heat
> Were shaped the anchors of thy hope!"

The stress of the present day and the demand for higher efficiency mean energy of body and energy of mind. The way is full of hard pulls and there are no short cuts. To raise a ton of material through a vertical distance of 100 ft., requires just so many foot-pounds. Clever combinations of levers will not lessen the amount of work.

The graduate should realize that a superintendent or a manager is not made by the presentation of a degree. The man who possesses the patience to make his start in difficult details, taking all as they come, mastering each stage of the course and making himself skillful with head and hands, is the one who makes the goal. There is no experience in the career of the engineer like that derived from intimate knowledge of details in the days of his apprenticeship. The self-confidence developed by shaping things with one's own hands is the most important, and he who can do the work himself is best equipped for the direction of others. This practical man, knowing the correct use of tools and the best distribution of materials, develops the best qualities in his workmen and plans each move to count for something, and the final result makes for strength and harmony.

After three or four years of technical school investigations, the overalls and the dinner-pail play their part in the rounding of some of our acute angles. You will never forget your first experience with the mine-timber crew, and the Austrian slag-pot pusher will show you some tricks in applied mechanics. Often points suggested by these earnest workers may be the inspiration of a great development. When a workman has the interest to improve some detail in your plant, give him due credit, and you will gain his respect and loyalty.

With all the energy of purpose and practical application, will success then be accomplished through intense devotion to one special line of a profession? The true success includes not only the skill highly developed in one direction, but requires that building of personal character, that interest and responsibility in matters of citizenship, Church and State, that shall round our polygon nature to the circle, the symbol of a splendid manhood. In a word:

"Whatsoever things are true, whatsoever things are honest, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report, if there be any virtue and if there be any praise, think on these things."

AN interesting occurrence of monazite has been found in Queensland. It has been known for some time that monazite occurs sparingly in the beach sands on the coast of Queensland, and that probably the most promising deposits are near the mouths of the Tweed and Johnstone rivers. These deposits have not as yet been proved to contain this mineral in commercial quantities.

The Timber Supply.

Every person in the United States is using over six times as much wood as he would use if he were in Europe. The country as a whole consumes every year between three and four times more wood than all of the forests of the United States grow in the meantime. The average acre of forests lays up a store of only 10 cubic feet annually, whereas it ought to be laying up at least 30 cu. ft. in order to furnish the products taken out of it. Since 1880 more than 700,000,000,000 ft. of timber have been cut for lumber alone, including 80,000,000,000 ft. of coniferous timber in excess of the total coniferous stumpage estimate in 1880.

These are some of the remarkable statements made in Circular 97 of the Forest Service, which deals with the timber supply of the United States, and reviews the stumpage estimates made by all the important authorities. A study of the circular must lead directly to the conclusion that the rate at which forest products in the United States have been, and are being, consumed, is far too lavish, and that only one result can follow unless steps are promptly taken to prevent waste in use, and to increase the growth rate of every acre of forest in the United States. This result is a timber famine. This country is today in the same position with regard to forest resources as was Germany 150 years ago. During this period of 150 years such German States as Saxony and Prussia, particularly the latter, have applied a policy of Government control and regulation which has immensely increased the productivity of their forests. The same policy will achieve even better results in the United States, because we have the advantage of all the lessons that Europe has learned and paid for in the course of a century of theory and practice.

Lest it might be assumed that the rapid and gaining depletion of American forest resources is sufficiently accounted for by the increase of population, it is pointed out in the circular that the increase in population since 1880 is barely more than half the increase in lumber cut in the same period. Two areas supplying timber have already reached and passed their maximum production—the northeastern States in 1870, and the Lake States in in 1890. Today the Southern States, which cut yellow pine amounting to one-third the total annual lumber cut of the country, are undoubtedly near their maximum. The Pacific States will soon take the ascendancy. The State of Washington within a few years has come to the front and now ranks first of all individual States in volume of cut. At present but one-fifth of the total forest area of the United States is embraced in National Forests. The remaining four-fifths have already passed or are most likely to pass into private hands. The average age of the trees felled for lumber this year is not less than 150 years. In other words, if he is to secure a second crop of trees of the same size, the lumberman or private forest owner must wait, say, at least one hundred years for the second crop to grow. As a rule, such long-time investments as this waiting would involve do not commend themselves to business men who are accustomed to quick returns. But the States and the Nation can look much farther ahead. The larger, then, the area of National and State control over woodlands, the greater is the likelihood that the forests of the country will be kept permanently productive.

OWING to the demand for ferromanganese and spiegeleisen, the requirements of the steel manufacturers in the ores that are used to produce these metals has been slightly modified, particularly in the reduction of the phosphorus minimum.

A Visit to Ely, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES W. ABBOTT.

Anyone approaching Ely from the west leaves the Southern Pacific train at Cobre, 405 miles east of Reno and 137 miles west of Ogden. Just two miles west of Cobre the train passes a siding where today not even a freight is scheduled to stop. About this siding, if one looks closely, may be seen some ruins of the old town of Toano, famous in the days of Nevada's primary period of production. Then the Central Pacific was the only railroad to the Coast and Toano served as the shipping point for the rich camps in White Pine and Lincoln counties. The regular rate for freighting supplies to Pioche, 250 miles to the south, was six cents per pound, and in similar proportion to other camps according to distance, while by Pritchard's 'fast freight' the rates were much higher. This express service had regular stations, where the mules were changed, so that the wheels were kept rolling day and night.

Excavating for Foundations of Concentrator.

Until recently the belated traveler, compelled by mischance to spend the night at Cobre, obtained atrocious meals, a cot in a tent corral, and no adequate protection against a climate often bitterly cold. The rapid march of progress throughout this entire region has already bettered conditions in many ways. Now even the limited trains actually stop at Cobre, where a comfortable hotel, managed by refined people, furnishes wholesome food and suitable beds. Daily standard pullman cars run through each way between Ely and Salt Lake City, and new equipment to be immediately installed on the Northern will further ameliorate travel to the Nevada mines.

This railroad from Cobre to Ely (141 miles) runs through the Steptoe valley, an old lake-bed, level as a floor and nowhere less than five miles wide. Throughout this entire distance the rise in elevation, approximately uniform, averages less than three feet to the mile, and there is neither cut nor fill, culvert nor bridge, more pretentious than one finds on the ordinary country highway. When the roadbed becomes thoroughly settled and is properly ballasted, the railroad conditions will resemble those in the Mohawk valley on the New York Central.

The Site of the Big Smelter at McGills, April 1, 1907.

The first station on the road to Ely, 20 miles from Cobre, is Bews, the place where Gould's Western Pacific line to the Coast will cross the Nevada Northern. From Bews to Salt Lake by the Western Pacific is about 160 miles, practically 35 miles less than it is by the Southern

Pacific. Bews, yet a tent city, is today the centre of great activity. The Western Pacific, already operating its construction trains 85 miles out from Salt Lake, hopes to reach Bews about next Fourth of July, when daily Pullman service to Ely will be established by that line also. Three different routes for a branch road to Ely have been surveyed, and as soon as one of these has been selected, grading is to begin. The Clark road (San Pedro, Los Angeles & Salt Lake) will without doubt extend its Pioche branch (now under construction from Caliente) to Ely, while two lines are already projected west from Ely to Tonopah, one of which is sure to be built in the immediate future. Ely then, with its own Pullman service to San Francisco, Los Angeles, and Salt Lake by the Santa Fe, Southern Pacific, Western Pacific, and Clark systems, may be expected to confidently challenge any other mining camp on earth (not in Nevada) to rival her facilities for transportation.

When the Nevada Northern was first built, inflated by the opportunity presented to make money, the railroad company began to levy toll in a fashion that Ely much despised. The old Southern Pacific theory, so vividly remembered in California, of levying "all the traffic would bear," was here exemplified in 10 cents per mile for passenger fares and the former wagon-rates for freight. But a new management, with clearer perspective (perhaps influenced by the Nevada State Railroad Commission), has seen a great light, and definite promise of immediate relief to come has made the heart of Ely very glad. Present rates on brick and cement from Salt Lake to Ely are, respectively, $12.80 and $9.60 per ton. On April 17 the rate on brick dropped to $8 per ton, and on May 13 cement went to $5.60. The lumber rate today is nearly $20 per thousand feet, but it is confidently expected that this will be decreased at least one-third, while even a four-cent passenger rate is expected by the optimists.

Eighty miles from Cobre the railroad passes through Cherry Creek, a high-grade silver camp, where they are now reviving memories of White Pine days. One hundred and twenty-eight miles from Cobre, with Ely yet 13 miles away, the train stops at a water-tank, just on the border of a region where history is being made rapidly. On the gentle slope of the foothill three miles to the east, is arising what is to be one of the world's notable industrial cities. It is known as McGill's, named after old Billy McGill, who located a ranch here early in Nevada's primary period and for 35 years raised potatoes, hay, and a family. Billy McGill believed in the country and he kept gathering unto his ranch contiguous acres until his faith reached fruition a year or so ago when he sold his holdings to the Steptoe Valley Mining & Smelting Co. for $90,000.

The interests at the head of the American Smelting & Refining Co. entered the Ely district about two years ago and secured the properties now grouped into two corporate managements, known as the Nevada Consolidated and Cumberland-Ely companies. They built and own the Nevada Northern railroad, and control the company that is erecting the vast reduction plant at McGill's to treat their own product, present and prospective, as well as custom ore. The Nevada Northern is planning to drop a network over the hills behind Ely. Over these will come the cars laden with ore. When this ore drops into the bins it will probably contain an average of less than 2½% copper. It will leave McGill's ready for the refinery.

The plant of the Steptoe Valley Mining & Smelting Co. is to be 6,000 ft. long and will have separate concentrating, leaching, and smelting departments. The concentrating department is planned to have 10 sections, each with a capacity of 1,300 tons daily of crude ore, to be concentrated in the ratio of seven into one. Three of these sections, or units, are to be completed immediately and installed with the least possible delay. Two 3-yard bucket Bucyrus steam-shovels are now at work day and night excavating for the foundations, and their labor is being supplemented by six 4-horse scrapers, two 2-horse ditto, a 6-horse plow, and a 2-horse stone-boat, all delivering dirt on top of the bank above the shovels.

Should the concentrator get into service ahead of the smelter, its product will be shipped temporarily to Garfield, near Salt Lake City.

It is the purpose to start the smelter plant with 16 McDougal roasters, each with a daily capacity of 40 to 50 tons of concentrate; three 111 by 19-ft. reverberatories, each with a daily capacity of 250-300 tons; a blast-furnace for smelter-slags and odds and ends; and three 15-ton converters. The stack, to be the largest ever constructed, will be 550 ft. high, with an inside diameter of 23 ft. at the top. The main flue leading to it will be 1,400 ft. long, with branches from the roasters and reverberatories. A power-house, 320 by 135 ft., to generate at first 8,000 h.p., is to be built at once. The grading for roasters, reverberatories, and power-house is already practically done. The hillside has a slope of about 10%, thus lending itself readily to the plans for automatic handling of products in the successive processes of treatment. The company has purchased the right to the water of Duck creek, on the eastern slope of the hill. The plan will probably be to bring this water through the hill in a 2,600-ft. tunnel and with it to generate 10,000 h.p. Springs on the old ranch also furnish the water now being utilized for immediate needs.

Ely, like Gaul, was once divided into three parts. Ely proper was the old Robinson camp, in the days when the Eberhardt mine at Hamilton, 50 miles west, was turning the heads of millions of people and making the name of White Pine as well known throughout the world as Pioche and Virginia City. At the zenith of its frenzy the three camps of Hamilton, Shermanville, and Treasure Hill, which together constituted White Pine, had a population of 30,000 and the streets at times were filled with a dense mass of humanity, making traffic well-nigh impossible. As in all mining excitements, the restless tides ebbed and flowed. Distance lends enchantment. The search for the Golden Fleece lures men from camp to camp, and the prospector is the typical Wandering Jew. Pioche was ever a magnet, drawing recruits from White Pine, and the gold of Robinson Camp furnished diversion by the way. So the stream from White Pine to Pioche helped to swell the camp at Robinson, and many tarried there to prospect.

It was the lure of gold that brought the pioneers to these camps of the West, now famous for copper, and in this respect Robinson had a history akin to that of Butte, Iron Mountain, and Bingham. Here also the gold played out and the detested copper came in and for years gloom and despondency attended the transformation.

Some time before the new day had dawned for the old camp its name had been changed to Ely. Then came the real estate boom. Bordering Ely to the north, Steptoe valley widens out into a regular flat with alluring opportunities for corner lots, the play of fancy and the temptation to glowing rhetoric and other things. They call it Ely City. Up the cañon of Robinson creek, two miles nearer to the mines, the gulch widens to a flat with a good many acres suitable for building. The real estate man has attached to this evidence of God's bounty the name Lane City, and a goodly hoard of dollars has been gathered from lots here sold at city prices. So the three parts into which Ely is divided really form one commun-

ity which, to the world outside, means just Ely. Lane City will always be in demand for miners' homes, because nearer to their daily work. Whether the commercial supremacy will remain with the old town or be shifted to its rival will depend upon conditions yet to develop.

What the future of mining in that belt shall be must depend also upon conditions not yet clear. Enough is already known to suggest the splendid future of Ely. Two properties of the Nevada Consolidated, the Copper Flat and the Ruth, have been examined separately by three different mining engineers, of high repute and wide experience. One of these reported 16,000,000 tons of commercial ore in the Copper Flat and 6,000,000 in the Ruth, averaging about 2.3% and which should yield a profit with 10c. copper. Another reported 12,000,000 and 10,000,000, respectively. The exact figures of the third report have not been given out, but it is known that he confessed to finding over 20,000,000 tons in the two properties.

No one believes for a minute that either of them reported all he saw. For seven miles in length and in places over a mile in width, copper ore has been found along the belt. Besides the Copper Flat and the Ruth, the Cumberland-Ely, Chainman Group, Giroux Consolidated, Turner-Ely, Ely Central, Ely-Witch, Ely Mines Co., Boston-Ely, Ely Consolidated Copper, Federal-Ely, McDonald-Ely, and the Ely-Revenue are all known to be in ore, but how much they have is not known. The Giroux Consolidated has recently been examined by engineers representing those in control of the Nevada Consolidated and the Cumberland-Ely properties. The report has not been made public, but the salient facts are that in the Alpha shaft, at 1,000 ft., there have been found bodies of ore 50 ft. wide that assay 20% copper, still oxidized, so that there is probability of finding even large masses of concentrating ore below the zone of oxidation.

When nature starts in to mineralize a whole body of porphyry and make ore out of it, there is a good deal doing and it is not easy to draw the line.

GOLD MOVEMENTS into the United States in the fiscal year which ends with this month will exceed those of any earlier year, and the excess of imports over exports of this metal will also probably be greater than in any earlier fiscal or calendar year. The 10 months' figures of the Bureau of Statistics of the Department of Commerce and Labor now available show gold importations amounting to $109,616,707 and gold exportations of but $23,003,407, making the excess of imports over exports in the 10 months $86,613,300; while for the 12 months ending with April the imports of gold are $146,896,815, and the exports are $31,981,947, making the excess of imports over exports for that period $114,914,868. The largest importations of gold ever occurring in any fiscal year were $120,391,671 in 1898 and $100,031,259 in 1881, while in no other fiscal year has the total of gold imports ever crossed the 100-million-dollar line. A comparison of these figures of excess of imports over exports with those of previous years indicates that unless a marked change shall occur during the next two months in the general movements of gold into and out of the United States, the net imports for the full fiscal year about to end will be larger than ever before. The only fiscal year in which the net imports of gold, or excess of imports over exports, exceeded 100 millions was 1898, when the figure of net imports was $104,985,283. The nearest approach to the 100-million-dollar line on any other occasion was in 1881, when the net importation of gold was $97,466,127.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Two specimens of Andesite were sent by T. P. B., of Alamos, Mexico.

G. H. H. sends a specimen of Kaolinite from Sulphur Springs, Colorado.

A specimen of black Quartzite was sent by P. G. from Naranjera, Mexico.

The brown mineral sent by J. W. O., of Piute, Cal., is an Andradite Garnet.

Specimens sent from Mill Valley, Cal., by W. B. H., have not been received.

A specimen of the arsenic ore, Realgar, was sent by D. F. O., from Manhattan, Nevada.

The two specimens which were sent from Denver by S. W. and which were supposed to contain Tungsten are Magnetite in a Pegmatite Granite.

The Kaolinite from Yerington, Nev., sent by C. B. C., appears to be of good quality. Some Western firms using clay are: Corona Press Brick & Terra Cotta Co., Corona, Cal.; Douglas Clay Product Co., Los Angeles, Cal.; St. Louis Fire Brick & Clay Co., Los Angeles, California.

The rocks sent from Nogales, Ariz., by E. E. N., are: No. 1, Quartzite; No. 2, Quartz; No. 3, Andesite; No. 4, altered Andesite; No. 5, Dacite; No. 6, Rhyolite Tuff; No. 7, Rhyolite Porphyry; No. 8, Andesite; No. 9, Dacite; No. 10, Dacite; No. 11, Andesite; No. 12, Andesite; No. 13, impure Limestone; No. 14, Rhyolite; No. 15, Rhyolite.

SILVER MOVEMENTS into and out of the country seem likely to show a smaller excess of exports over imports in the fiscal year about to end than on any occasion during the past decade. Movements of silver into and out of the United States are in each case large, the inflow coming chiefly from Mexico. This large movement of silver into the United States, already a great silver-producing country, is due largely to the fact that her facilities for smelting and refining are more satisfactory than those of her silver-producing neighbor, Mexico, and that Mexican silver moves to the smelting and refining establishments of the United States, a part of it coming in lead ore and a part of it in the form of base bullion. The largest imports of silver in any full fiscal year were those of 1906—$41,442,540—and those of the present fiscal year seem likely to be about the same. The largest exports of silver in any fiscal year occurred also in 1906—$65,869,063—while the total for the present fiscal year seems likely to fall considerably below that of last year. The excess of exports of silver over imports of that metal amounted in 1906 to $21,426,523, and has been continuously above the 20-million-dollar line (and in some cases above 30 millions) since 1893, but the present indications are that the excess of exports over imports will, in 1907, be far below that of any other year in the period just named. For the 10 months ending with April, 1907, the excess of exports of silver over imports of that metal was $11,191,235, and for the 12 months ending with April, $13,086,196, against $21,126,523 in the fiscal year 1906.

Silver-Lead Smelting Practice.—IV.

Written for the MINING AND SCIENTIFIC PRESS
By T. S. AUSTIN.

LOSS OF GOLD IN REFINING BASE-BULLION.—[In a letter written in 1887, referring to gold losses in refining, he says:] There is a tendency to favor a higher result when the amount of gold is small. This may come from using dilute acid, from imperfect washing, and sometimes from errors in weighing. Of course, in a large works care should be taken to work up everything that contains gold or is liable to contain it, that is, the gold alloy, the drosses of every kind, the blue powder. It is more likely that the loss comes in the assaying, or possibly in the sampling, or both. There is also one more direction to watch and guard against loss, namely, in the silver bars. Is all the gold taken out in the first zincking, that is, the gold-skim zincking? You know how we always tested for gold after this zincking, and not infrequently found it. If bullion is not clean when it comes from the softener, this slip may happen, and you know that in some works they add a certain amount of zinc no matter what the charge is. In the old days at the Germania, when we did not zinc for gold, but took it and the silver out together, there was no loss of gold. It was in later years when there were two first zinckings, that is, gold and silver, that the gold-losses appeared, though they were never great.

SILVER-LEAD SMELTING WITH CHEAP LEAD ORES.—[Referring to conditions where there was plenty of lead ore to be smelted, and where, in consequence, some might be wasted in the slag, he says:] It costs more to keep the slag at 1% than higher; by getting a correct composition you will do good work in your running of the furnace, as well as metallurgically. If you had a fair amount of coke and a pretty good charcoal you could run a three-quarter slag (33% SiO_2, 34% FeO, and 23% CaO) and could do good work. This would be about as much lime as you would care to run. With enough fuel you could get a slag of 0.5 to 1.0% lead, and (with low-grade bullion) practically free of silver. Remember that though lime is a good cleaner, it takes considerable heat to melt it. My experience has been, however, that a three-quarter slag requires but little more fuel than a half-slag.

CONDITIONS OF SMELTING INDUSTRY IN 1894.—I think very poorly of the smelting business just at present. The big plants at the smelting centres can, and will, control the entire thing, and I have about made up my mind to pay no further attention to smelting for the present. Of course I can see that improved methods will, or would, make a great difference financially; but these methods are already in the hands of the large central works and enable them to crush out the small plants that have not got the railroad and other facilities.

MECHANICAL FEEDING OF SILVER BLAST-FURNACES.—[In 1894, referring to the mechanical feeding at Pueblo, he says:] It is a very good way, where you are rigged for it, and it effects a considerable saving in labor. Still I cannot get away from the notion that it is necessary to see and control your feeding. On the other hand, our labor here (in Mexico) is unreliable, and it might be that such a mechanical device as you describe would be more certain and regular than our hand-feeding. For are not the irregularities that we have to remedy by special feeding caused by the negligence of the men themselves (especially in the small hours of the morning)?

MATTE CONCENTRATION.—There is but one way to concentrate leady copper-matte, namely, by blast-furnace smelting. I use a solid hearth and tap the lead, matte, and slag into a settler, from which I run the slag and matte into an ordinary pot. These pots are set out to cool, and the matte broken off. Lead is emptied or tapped periodically from the settler.

I find it best to have high reduction, and get all the lead possible out of the copper matte. It saves lead, both in the slag and in the matte, and there is no objection to it as far as the furnace-working is concerned.

MATTE AND SLAG SEPARATION.—It strikes me that the mode of handling and fussing with their slag at the Grant smelter (Denver) is not very rational. It seems like a mussy performance, and not so good as the forehearths or settlers. Unfortunately, settlers are not always sure in their separation, and require frequent changing. They also require very nice settling and a good slag. In removing slag, small pots seem rather barbarous and primitive, especially in connection with big dumps.

THE SLAG SEPARATING FURNACE AT EL PASO.—I have just got my separator repaired and in shape, and am ready for another year's campaign with it. It did not freeze up, but the fire-box lining was about consumed. It certainly works very well now that it has been overhauled, and takes the silver pretty well out of the slag. We ran ten days with overflow pots, and did good old-fashioned work, but our slag-shells were about double in silver to what they would have shown on the separator, *ceteris paribus*. At Monterey, where the separating furnace is employed, they have to be careful what type of slag they use. The zinc in the slag is almost at a point where it is liable to settle out in the separator, and make a troublesome crust. They wish to make a lime slag for commercial reasons, and were afraid that it would not work in the separator. However, their experience and my observation convinced me that such fears were groundless, and that a properly devised three-quarter slag would be clean and give good separation. It seems that when using a one-to-one slag a crust was formed in the furnace. It was only brought into shape again by the use of a two-fifths slag. After this trial it was run on a three-quarter slag until an exact one-to-one slag was tried on it for two days, but, as a zinc crust again showed up, we dropped back to the modified three-quarter slag; the separator immediately came into good condition, and was in that condition when I left. I may say that under the present conditions of ore supply, the separator will be eminently successful, if run on a proper slag of between the limits three-quarter to seven-eighths lime-iron ratio, with silica not too high.

CRUCIBLE DROSSES.—Dross may come from bad reduction, or, it may be due to the presence of copper accompanied by over-reduction, or again, with copper, to the lack of sulphur to take up that metal in matte. With much dross in the crucible one may notice that the slag is not exactly correct, and, at any rate, pretty high in lead, with the furnace working irregularly above, that is, with over-fire, hot-top, and blowing through violently.

TREATMENT OF SPEISS.—The formation of speiss upon the surface of the lead in the crucible is almost unavoidable, and especially when running a slag high in iron (as a quarter-slag) and when, with much arsenic present, the slag becomes incorrect. Roasting would be the natural method to follow; otherwise there is a loss of silver and lead in the speiss and matte and bad working

*These observations of T. S. Austin, recently deceased, general superintendent of the Southern Department of the American Smelting & Refining Co., are compiled from letters written by him to his brother, from 1883 to 1906, covering most of the period of his wide experience in silver-lead smelting, and to some extent that in base-bullion refining. They lack some of his recent experiences, but show that much of his knowledge had been brought into finished form some time before his death. The notes refer largely to his work at Socorro, New Mexico, Monterey and Chihuahua, Mexico, and to El Paso, Texas, together with other technical observations made during that time. Professor L. S. Austin's remarks are in brackets. The first of this series appeared in our issues of February 23, March 16, and April 27.

of the furnace, which will make the smelting of such stuff run both expensive and difficult. The point is that where arsenic makes speiss upon the charge, it needs the more silicious and lime slags to keep it liquid and to carry it out of the furnace. The irony slags are inefficient in affecting this. If containing copper, it is hard to desilverize it. It might perhaps be done by putting it through a blast-furnace with refining-skimmings together with some sulphide ore, the copper going into the matte and the arsenic being, in part, volatilized, and at any rate desilverized, the furnaces being run with poor reduction. However, no great percentage could be put through for fear of trouble at the tuyeres and at the crucible. Speiss, when ground finely and roasted with pyrites, would be so improved as to give no further trouble at the blast-furnace.

The Legal Work of a Mining and Reduction Company.

When the legal business of an incorporated and fully equipped mining company justifies it, the services of a law firm may be secured for these duties, and when it has a large amount of property to take care of, a special department insures the systematic transaction and economical management of its legal business. Above all, the rights of the company must be defended in their patented claims, which, under the United States law of the apex, are liable to be brought into litigation. In the first place, every legal precaution should be given to making the patent of the property clear; and in those cases where it may happen to be defective, it will need to be skillfully defended—the loss of such rights involving the very existence of the company. In those States where, under the common law, the property is included within the vertical planes of its borders, these difficulties are largely eliminated. One has to but recall the litigation between Heinze and the Amalgamated to realize the importance of legal effort.

The corporate management of a large company is particularly under legal observation. By incorporation it is possible to unite the resources of many for a common purpose, to avoid the embarrassment due to the death of one of its members, and to limit the liability of any member. A charter of incorporation can be obtained under the laws of any State and a lawyer is properly employed to do this. The charter having been obtained, by-laws must be framed for conducting the corporation business of the company, to provide for its meetings, officers, and management. The preparation of the by-laws and the amending of them from time to time is legal work. There is also the preparation of motions, the drafting of resolutions to be adopted at meetings of the stockholders and directors of the company, and the preparation of minutes of corporate meetings. Nearly all corporate action takes the form of written resolutions, and such resolutions have to be prepared with great care. In case of the consolidation of different mining corporations into one, or the purchase of property from another, the minutes of the meetings of the corporations involved are frequently elaborate, and must be carefully framed in accord with the several statutes covering the transaction. There is also the preparation of the contracts of the company when it rents land or houses. Leases must be prepared to protect the right of both lessor and lessee.

The preparation of mortgages, where bonds are to be issued, calls for the greatest care. The financing of the company may depend upon these instruments, and elaborate provision must be inserted therein, in order to tempt capitalists to invest in the bonds, and to provide for them the security to which they are entitled. Contracts for construction may involve large sums, and careful specifications and provisions are needed to prevent litigation. Also, where land or property is bought, deeds must be drawn. If, for any reason, it is undesirable to commit the company to the purchase of a mine or other property, or if time is necessary to examine properties with respect to their value and title, options must be drafted, giving the privilege of acquiring the property if desired. Contracts must often be made for the purchase of fuel, fluxes, timber, or other supplies.

Turning to the subject of litigation, damage suits for accidents are unavoidable, some involving fictitious, exaggerated, or real injuries. Where the company is operating smelting furnaces, which yield noxious gases, damages to land or stock may be claimed on this account also. Companies receive and dispatch a large amount of ore, products and supplies by rail, and since railroads insure the freight, they are called upon to pay claims for damages, where accidents, and especially fires, give rise to such claims. The injury or delay of materials in transit may also be productive of claims of the company against the railroad; such claims, when they cannot be adjusted peaceably, ultimately give rise to suits, but even before suit is brought, legal advice is necessary in the process of adjustment. The company may be harrassed by garnishment of the wages of its employees and the danger of double payment must be guarded against. The arrest of wrong-doers has to be made under legal advice, as upon failure of any criminal proceeding, a suit against the company for malicious prosecution may be expected.

The relation of the company to the State calls for legal services. Sometimes it may be to defeat hostile legislation in the Congress, or in the Legislature. The subject of taxation is always involving some controversy, and may give rise to litigation.

If anyone is injured or killed it is the business of the lawyer to reach the spot promptly and endeavor to settle claims without delay. Even a small delay involves having to pay the claimant's lawyer as well as himself. The statements of witnesses are to be taken down in writing, both for enlisting the witness on behalf of the company, and for recording the facts before they are forgotten. The importance of such work is seldom appreciated, but as a rough estimate, it is about three times as expensive to dispose of a claim by litigation as by amicable settlement. The effort to settle should be continuous, instead of being dropped until suit is brought. It is false economy not to have this strictly looked after. In conclusion it may be remarked that, just as in medicine it is cheaper and more effective to prevent than to cure disease, so in the conduct of the affairs of a mining company it is better to consult the lawyer before than afterward.

THE coarser and cheaper forms of asphaltic substances are used extensively in the manufacture of roofing and paving materials and for waterproof paint on wood, iron, and stone work. The demands of the Eastern markets are supplied for the most part from Trinidad, Venezuela, and Sicily, but the California oil-asphaltum has been used to some extent for street pavements and other purposes in New York and other Eastern cities. Gilsonite, or uintahite, is a very pure form of hard asphaltum, which is separated and sold in two grades. The best grade is used for making varnish for ironwork and for baking japans, and similar purposes. Second-grade gilsonite is used as a cement in making pavements. Wurtzilite is similar to gilsonite in appearance and occurrence. It is refined and used for marine and iron paints and insulation, and as a substitute for rubber in certain compounds.

The Amalie District of California.

Written for the MINING AND SCIENTIFIC PRESS
By L. H. DYKE.

This district is in the central part of Kern county. Amalie, the oldest settlement in the district, is 40 miles east of Bakersfield and 12 miles from Caliente, the nearest railroad point. A daily stage runs from Caliente through Amalie to Piute. There is also a daily stage from Caliente, through Havilah and Vaughn, to Kernville.

During the last year there has been some activity in mining in this district. In July, the Gold Peak Mining Co. began operating its new plant, which is situated in the Caliente cañon, 12 miles from Caliente. The plant consists of a 10-stamp mill, five Frue vanners, and a cyanide plant of six vats for treating sand and two vats for the treatment of slime. The power is furnished by two gas-engines, one being used to run the rock-breaker, stamps, and vanners; while the other runs the pumps, the dynamo for the electric lighting, and the small machinery, such as the sample-crusher and pulverizer and the zinc-shaving machine. The present workings of the mine are half a mile from the mill and 300 ft. above it. The ore is conveyed from the mine to the mill by an aerial tramway operated by gravity. A large and well appointed assay-office completes the equipment.

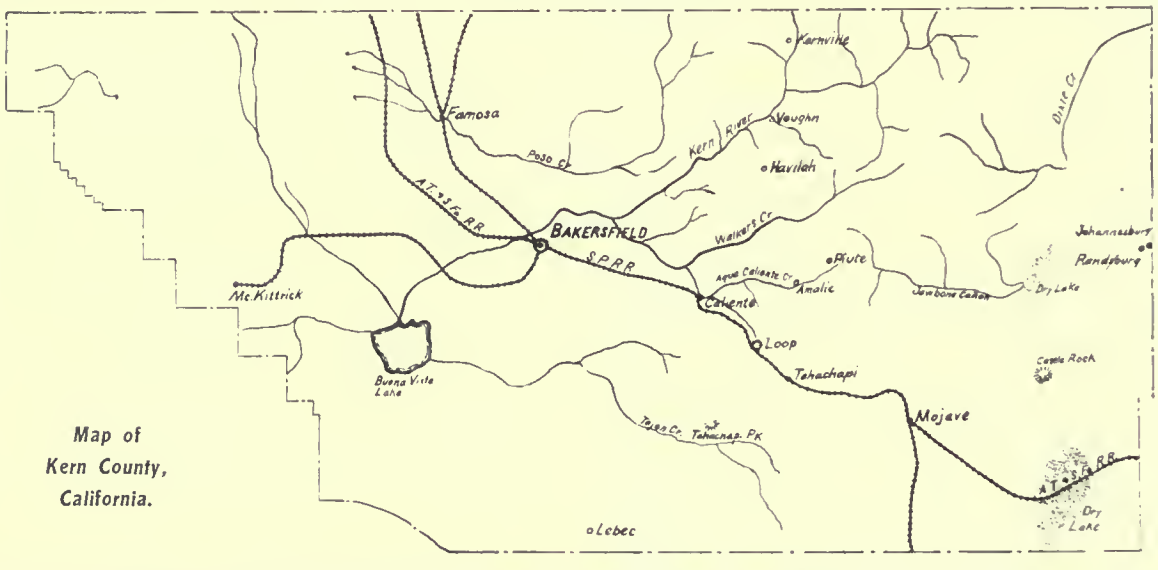
The plant of the Zenda Mining & Milling Co. is situated 10 miles from Caliente and consisted originally of a 10-stamp mill and a cyanide plant. Last summer, however, the cyanide annex was discarded and a pan-amalgamation plant was installed. As now equipped the plant consists of a 10-stamp mill, three Standard concentrators, four 5-ft. pans, and two 9-ft. settlers. The power is furnished by a 75-h.p. steam-engine. The company also maintains a small, but fairly well equipped, assay-office. The Zenda mine is three-fourths of a mile from the mill and 500 ft. above it. An aerial tramway operated by gravity has been built to convey the ore from the mine to the mill. Since the installation of the pan-amalgamation process the mill has been treating second-class ore from the dump of the Cowboy mine, situated about two miles from the mill. After doing this custom work, the Zenda mill was shut down in order to make repairs and improvements. Both the Zenda and Cowboy companies are now engaged in developing their properties.

The Amalie mine, about two miles north of Amalie, is the oldest mine in the district. It has been in litigation for several years, but the difficulties have recently been adjusted and the plant is being repaired preparatory to pumping out the mine and resuming mining. The Amalie is the only mine that has been worked below water-level.

The ore is low-grade. The relative value of the gold and silver is in the ratio of one to four. The principal silver minerals are cerargyrite and argentite. Some pronstite is also found. The district is highly mineralized,

The Zenda Mill.

and there are several prospects that appear promising. But the development work and mining have been carried on in such a desultory manner as to fail to reveal what may be in the mines.



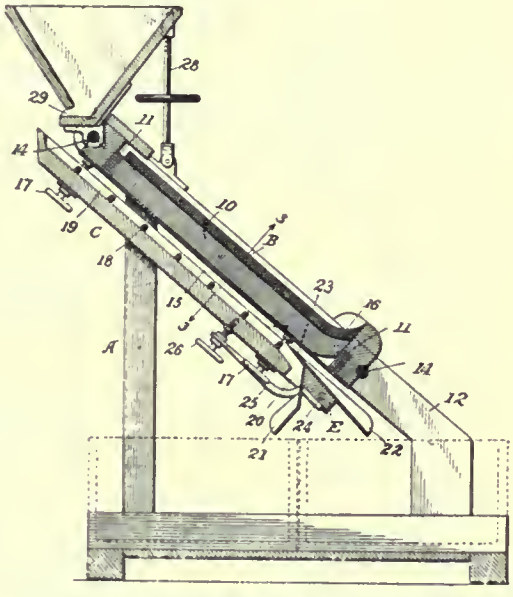
Map of Kern County, California.

BARON MUNCHAUSEN.—The author of this book was Rudolph Eric Raupe, who posed as a mining engineer and victimized people by his reports. He was the author of numerous scientific works, including an account of some German volcanoes in 1776; he translated the works of Ignaz von Born and J. J. Ferber. Born in 1737, he was educated at Gottingen, and became curator of the collection of coins at Cassel, where he appropriated 2,000 dollars' worth of medals. He was hunted over Germany, being captured at Clausthal, when he escaped to England, and was for some years storekeeper and assayer at Dolcoath mine in Cornwall. There he wrote 'Baron Munchausen.' Subsequently he was mixed up in some unsatisfactory prospecting in Scotland, and victimized a Highland proprietor. The incident furnished the material for Sir Walter Scott's Dousterswivel in 'The Antiquary.' He died in 1794, having sought refuge in the north of Ireland.

MINING AND METALLURGICAL PATENTS.

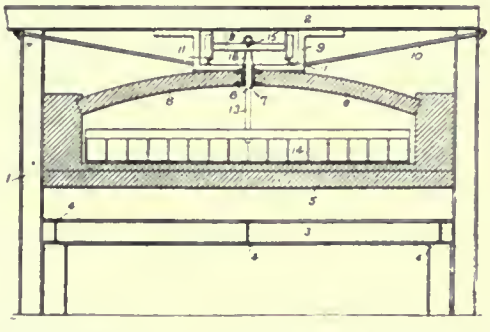
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MAGNETIC ORE-SEPARATOR.—No. 855,166; Edgar A. Edwards, Cincinnati, Ohio, assignor to Alice V. Edwards, Cincinnati, Ohio.



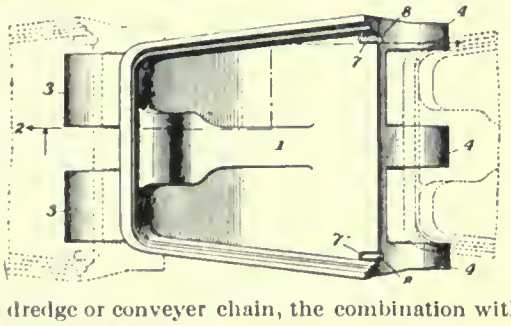
In an electro-magnetic separator, the combination with an inclined magnetic element the under surface of which co-operates with the material under treatment, of a circuit therefor, a source of energy adapted to produce in said circuit an alternating current having periods of rest between successive alternations, and means for feeding stock beneath said element.

ORE-ROASTING FURNACE.—No. 854,766; William H. Smyth, Berkeley, California.



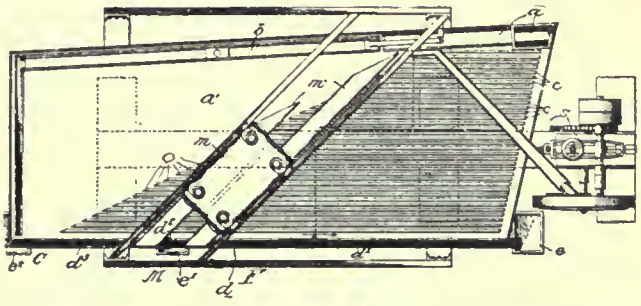
In an ore-roasting furnace, an arched roof provided with a slot the full length thereof intermediate of its sides and means adapted to support the arch; the roof is longitudinally slotted intermediate of its sides, rabbles or stirrers in the furnace and longitudinally traveling means, supported upon tracks, to which the rabbles or stirrers are attached, said means passing through the slot.

DREDGE-BUCKET JOINT.—No. 854,731; Alexander T. Fraser, Butte, Montana.



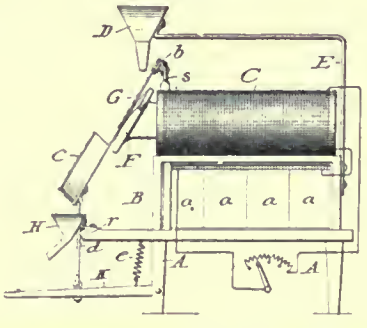
In a dredge or conveyer chain, the combination with the links having lugs and with the pivot pins, of bushings for certain of said lugs, each bushing comprising two relatively movable reversely tapered parts adapted, when assembled, to securely hold the bushing in the eye of the lug.

SHAKING-TABLE SEPARATOR.—No. 854,768; Frederick T. Snyder, Chicago, Ill., assignor to the International Separator Company, Chicago, Ill., a Corporation of New Jersey.



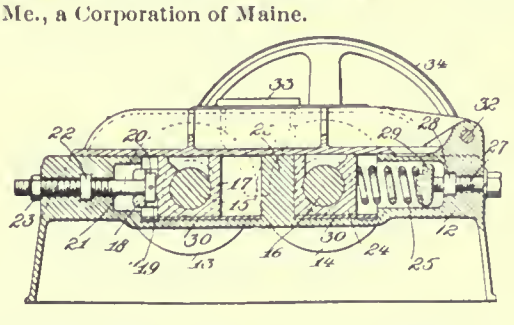
In a concentrator, the combination with a transversely inclined shaking table having longitudinal channels thereon, of means for feeding a mixture of magnetic and non-magnetic minerals and gangue to the head of the table, means for imparting a differential reciprocating motion to the table parallel to said channels in a direction to cause a travel of the mixture toward the foot of the table, means for flowing water across the table transversely to said channels to remove the gangue from the mixture, and a magnet suspended above the table near the foot thereof and adapted to exert a lifting force upon the magnetic constituents of the mineral concentrate, sufficient to cause said constituents to be washed by the water across said channels into a path divergent from the remainder of said concentrate.

APPARATUS FOR SEPARATING GOLD FROM MAGNETIC SANDS.—No. 854,997; Elmer Gates, Chevy Chase, Md., assignor, by mesne assignments, to Washington Loan & Trust Company, a Corporation.



Apparatus for separating gold from magnetic sand, comprising a magnet producing a non-uniform field, an inclined screen or apron extending within the magnetic field and upon which the material is fed, and means for imparting a succession of rapid but slight vibrations to the screen or apron, whereby the magnetic sand is arrested upon the screen.

ROLL CRUSHING MACHINE.—No. 855,358; Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Company, Portland, Me., a Corporation of Maine.



In a roll crushing machine, the combination with a machine frame having open topped recesses, of a crushing roll rigidly mounted on said machine frame, a second crushing roll, bearing boxes for said second crushing roll yieldingly mounted for sliding movement in said recesses, and a cover over said rolls and extending over the tops of said recesses, said cover thus providing upper guideways for said yielding bearing boxes.

Books Received.

FIRE ASSAYING, by Evans W. Buskett. Published by the D. Van Nostrand Co., New York City. Price, $1.25 net.

THE DESIGN OF WALLS, BINS, AND GRAIN ELEVATORS, by Milo S. Ketchum. A 388-page book, well illustrated, and with many working drawings, dealing with retaining walls, masonry, and reinforced concrete, ore and grain-bins, and large grain elevators. The Engineering News Publishing Co., New York. Price, $4 net.

MINE TIMBERING. By Wilbur E. Sanders, Bernard MacDonald, Norman W. Parlee, and others. This is a reprint of articles that have appeared during the last five years in *The Engineering & Mining Journal*, the *Proceedings* of the Canadian Mining Institute, and those of the Canadian Society of Civil Engineers. In default of a systematic treatise on the subject, this compendium will be of service to mining engineers and superintendents, as well as to students. The book is well printed and adequately illustrated with excellent drawings. It is issued by the Hill Publishing Co., and is for sale by the MINING AND SCIENTIFIC PRESS. Price, $2.

Publications Received.

ZINC AND LEAD DEPOSITS OF THE UPPER MISSISSIPPI VALLEY, by H. Foster Bain. Bulletin No. 294. U. S. Geological Survey.

THE PROGRESS OF THE MINERAL INDUSTRY OF TASMANIA for the quarter ending December 31, 1906. Compiled by W. H. Twelvetrees, Government Geologist.

E. E. MEYER, of Allegheny, Pa., issues a table of volumes through air-ways, in cubic feet per minute. It is a useful table and is printed on cardboard. Price 25 cents.

ECONOMIC GEOLOGY OF THE INDEPENDENCE QUADRANGLE, KANSAS, by Frank C. Schrader and Erasmus Haworth. Bulletin No. 296. U. S. Geological Survey.

THE GEOLOGY AND WATER RESOURCES OF THE WESTERN PORTION OF THE PANHANDLE OF TEXAS, by Charles N. Gould. Water-Supply and Irrigation Paper No. 191. U. S. Geological Survey.

GEOLOGY OF THE MARYSVILLE MINING DISTRICT, MONTANA. A study of igneous intrusion and contact metamorphism, by Joseph Barrell. Professional Paper No. 57, U. S. Geological Survey.

Trade Treatises.

ALLIS-CHALMERS CO., Milwaukee, Wis. Bulletin No. 1,060, on Allis-Chalmers Belted Alternators, of the revolving field self-contained type.

THE FRUE VANNING MACHINE CO., of San Francisco, has issued pamphlets on the Frue vanner, and the 'Brownell Patent Lip Flange' concentrator belt.

THE BUCYRUS COMPANY issues an elaborately illustrated and beautifully printed reprint of the President's message on the Panama canal. An excellent map of the Canal Zone accompanied the message, and is included in this pamphlet.

AN artistic catalogue (No. 22) of Chicago Giant rock-drills and kindred appliances is being sent to the trade by the CHICAGO PNEUMATIC TOOL CO. The book is printed in colors on high-grade paper and contains 96 pages of matter referring to rock-drills. The text is well written and fully explanatory, and is embellished with half-tone engravings illustrating the Chicago Giant rock-drills and views of parts, followed by several pages devoted to rock-drill steels, and a description of the method of lubrication. Several pages are devoted to Franklin air-compressors, another of the company's products, followed by illustrations and descriptions of the Baby Giant or One Man rock-drills, and scenes at work. Copies will be forwarded upon request by addressing the Chicago Pneumatic Tool Co., Fisher Bdg., Chicago, or 95 Liberty St., New York.

Commercial Paragraphs.

L. H. WYGANT, JR., for the past seven years with J. Geo. Leyner Engineering Co., is now associated with the F. M. Davis Iron Works Co., at Denver.

GOODALL, PERKINS & CO., western distributors for the Gold Brand Fuse, announce removal of their headquarters from Oakland to 24 Market St., San Francisco.

A. LESCHEN & SONS ROPE CO. has removed the New York branch office from No. 163-165 Washington St., to the West Street Bdg., on West and Albany streets.

THE HOSKINS COMPANY, of 93 Erie St., Chicago, send us a sample of their Brownite cupel, which is guaranteed not to break in transit. The one sent to us arrived in excellent condition.

THE CLASON MAP CO., of Denver, Colo., has published a new map of Arizona in the form of a folder. The retail cost is 25c. It is an excellent map, and ought to be of service to mining engineers.

BRODERICK & BASCOM ROPE CO., owing to increased business in New York and its vicinity, has found it necessary to move the branch house from 19 Murray St. to larger quarters at 76 Warren St., New York.

OSCAR J. FROST, assayer and chemist, of Denver, has removed his office from 1752 Champa St. to 511 Eighteenth St., two doors south from the Adams hotel, where he will be pleased to meet all of his clients. His new quarters are much better adapted for his work than the old place.

THE CYCLONE DRILL CO. informs us that J. C. Evans, of Youngstown, Ohio, has just returned from Zaragoza, South America, where he has been operating Cyclone drills, prospecting a placer property for the South American Development Co. The results were highly satisfactory. A dredge is likely to be sent on the ground.

THE LEONARD-HEISNER MACHINERY CO., Boulder, Colo., successors to the C. W. Knox Machinery Co., will install a complete plant for making cyanide and concentration tests on ores. This plant will be large enough to handle one-ton lots. Frank Leonard, who has been operating the Cash mine and mill at Magnolia, Boulder county, is manager of the company, and will have personal charge of the testing plant. It is also the intention to handle new and second-hand machinery, but principally new. They are now securing their agencies for the East.

THE CONSOLIDATED EQUIPMENT CO. of 17 Battery Place, New York, has been appointed selling agent for the Emerson pump. This company's well known triple vertical cylinder contractor's pump will be supplemented by a new product—the Emerson Junior. This pump is made with but a single cylinder, weighs but 219 lb., and has a capacity of 100 gal. per min. against a 25-ft. head, and about half this capacity on a 100-ft. head. A stock of regular and Emerson Junior pumps will be kept on hand in New York and at the factory in Alexandria, Va., which is to be enlarged to accommodate this new design.

FOUR of the largest silver-plated copper plates ever made for the recovery of gold in stamp-mill work have been recently completed for the Quartette Gold Mining Co. of Searchlight, Nevada, by the SAN FRANCISCO PLATING WORKS, E. G. Denniston, proprietor, 1349-1351 Mission St., San Francisco. Each of these plates is 5 ft. wide by 15 ft. long, containing 75 sq. ft. of amalgamating surface, and it is made of specially soft copper sheet heavily plated with refined silver. With the greatly enlarged capacity of the San Francisco Plating Works, silver-plated copper plates of any dimension can be produced.

Dividends.

On June 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 117 of $180,000. This makes the amount of dividends paid this year $1,080,000, and total to date $8,946,000.

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Editorial.

THE AMERICAN MINING CONGRESS will hold its tenth annual session at Joplin, Missouri, on November 11 and the five succeeding days.

IT HAS BEEN ASCERTAINED, after careful investigation, that during 1906 as much as $1,500,000 of ore was stolen from the mines at Goldfield, Nevada. Of this amount $250,000 has been recovered and the remainder lies hidden or cached awaiting a safe chance of sale to the smelters. In the meanwhile, it serves as a constant menace to statisticians, for while it was mined in 1906 it may be marketed in 1907, 1908, or even later. 'High-grading,' as the theft of ore is termed in the West, is the expression of anarchistic notions of property rights.

PATHETIC INTEREST, of a deeply regrettable kind, is attached to the letter from Chihuahua appearing under 'Special Correspondence.' It was written by H. L. Shrom. The day after he sent it, he fell 125 feet in one of the workings of the Palmilla mine, at Parral, and was instantly killed. We did not know him personally, but his letters, which he had begun to send only three months ago, were models of their kind, in crispness of statement and value for news. Only 36 years old, full of vigor, an earnest capable man, this untimely end is particularly sad. Good men are scarce. There are so many of the useless and vicious, who could be spared without any sense of loss, that we feel deeply the deprivation of men of real character and high purpose.

ALTHOUGH THE ANNUAL REPORT of the Amalgamated Copper Company gives, as usual, only a skeleton balance sheet and the mere pretence of an income account, it demonstrates one interesting fact, namely, that increase of profits is not in direct ratio to the rise in the price of copper. In 1905 this company's report said that "a fluctuation in the price between 11.7 and 16.5 cents per pound (the highest and lowest prices during the past five years) means a difference to a copper company of the magnitude of the Amalgamated Company of $9,700,000 in annual earnings, or 6 per cent on the capital stock." In 1906 the price ranged between 18 and 25¼ cents, as against a range of 18.87 and 15 cents the year before, and yet the gain in profits was only $4,992,000. What became of the balance? This is an example of the financial methods that have disgraced Amalgamated and caused it to be regarded as a blind pool.

SOME CANADIAN PAPERS have protested against the recent change in postal rates, but most of them, like our friend, *The B. C. Mining Exchange*, are inclined to take the increased impost in a reasonable manner. It

appears that Canada was doing nine-tenths of the work and getting only one-tenth of the revenue paid by second-class matter, and the post-offices at the border were burdened with an immense volume of yellow journals, especially the Sunday issues, with their weary drivel and hideous supplements. We have raised our subscription so as to meet the extra charge and no one has objected, for eight cents per copy is not much to ask for an earnest technical journal, seeing that it is less than the price paid in a mining camp for a poor cigar or a drink. The most expensive items in modern life are the carfare that takes you three blocks and the daily paper containing all the news that is unfit to print and a few facts distorted beyond recognition.

ENLARGEMENT OF BLAST-FURNACES continues at the Washoe plant of the Anaconda Copper Mining Company. The 87-ft. furnace seemed an achievement, for it has treated as much as 2,800 tons of charge per 24 hours, but now it is planned to make a furnace 126 feet long, by joining four existing furnaces and so utilizing the space between them. Incidentally, we make mention of the recent collapse of the big flue, leading to the main stack. It collapsed for a length of 108 feet at a place where it is 60 feet wide. This was due probably to weakening of the structure caused by the variation in temperature. At the same time the dust-chamber behind the blast-furnaces also collapsed, possibly by accumulation of gases held back by the closing of the flue. It took only four or five days to repair the flue, and a couple of weeks to bring the dust-chamber into serviceable condition. To Mr. E. P. Mathewson is to be credited much of the ingenuity and progressive spirit exhibited at this great copper smelter.

WE GIVE SEVERAL PAGES in this issue to an article on the filtration of slime during cyanidation by Mr. E. M. Hamilton. Next week our readers will get five more pages on the same subject. Those who are interested in the matter will appreciate the reason for giving so much space to Mr. Hamilton's article, which is one of the best that has been published during the last ten years. We confess also that he won the cordial esteem of the editor by the unusual excellence of his writing, both as to style and accuracy. It is rarely that a metallurgist so thoroughly the master of an important branch of practice is also so thoroughly competent to tell how his work is done; unfortunately too few of the men that really do things are endowed with the facility to say how they do it; therefore, the editor of a technical journal finds reason for felicitating his readers, and himself, when so notable an exception is afforded. Those of us who have taken an interest in the development of the cyanide process, especially of late in Mexico, are aware that to Mr. Hamilton belongs credit for the pioneer work on silver ores at Guanajuato and Pachuca. To Mr. Charles Butters also, to whom some of the most important of the early progress on the Rand is due, this article on his invention is a compliment that we are glad to offer, as being well earned.

Support the Law.

AT THE PRESENT TIME San Francisco is serving as a warning to other modern communities; the day will come, we hope, when she may be held up as an example of enlightened progress. In the meanwhile this City only illustrates another aspect of the feature we emphasized in our last issue, namely, the lack of strong public opinion in support of the law. To most people the self-confessed malefactor Orchard and his fellows are obvious enemies of society, in that they destroy the safety of life and the order of business, but it is equally certain that in the eye of the moralist or the political economist, Schmitz, Ruef, and the rest of them are anarchists also, in that they corrupt municipal government and cultivate a putrid kind of political idea, that is, they undermine the very foundations of the art of living in a big city. We go even further and say that those representatives of the corporations who took advantage of the City's weakness and its easily corruptible officials in order by bribery to get their franchises, gas rates, or other concessions, were also anarchists, because they lent a hand in destroying the fabric of a complicated civilization. And if they are better educated men, possessed ordinarily of higher notions of honor than the Schmitzes and Orchards, they also are more deserving of censure and punishment, for they were false to their own code. It will be said by way of excuse that they are the victims of conditions under which this community has grown up and that they are now sacrificed to a spasm of virtue. Let the excuse go for what it is worth.

The City and County of San Francisco has been outraged long enough both by capitalists and workmen; it is a pitiable fact that at this juncture the integrity of local government is represented by one official only, namely, the District Attorney, who has succeeded in getting indictments against a few of those implicated in the venality and misgovernment that have made San Francisco the talk of the world. It may be explained to our mining friends in Australia and South Africa that the Federal Government has no finger in this pie, nor has the Governor of the State any right to interfere, until insurrection occurs. The President undoubtedly has exerted some personal influence, but officially he has no more to say in these our troubles than the Archbishop of Canterbury. It is true, the Governor has been here and has made some remarks, varied by pronunciamentos that were accepted as the blank charges of a dress parade, but, being himself the product of a corrupt political condition, he has not the influence that such an official ought to have in this great Commonwealth. So this City, divided against itself, must settle its own affairs. The remedy had to come not from without, but from within. The mayor, the first violin of a vaudeville, elected as a laboring man on a labor-union ticket, had lent himself to corrupt agencies. The officials appointed by him were men of no character when they were not men of bad character. The Chief of Police is a disgrace to his office,

and is under indictment for extortion. The Board of Supervisors are confessed criminals. The various inspectors and commissioners are petty politicians, irresponsible and utterly discredited. Fortunately one official, also elected by the popular vote, also on the labor ticket, proved to be a good citizen. That was the District Attorney. But he had not all the ability and none of the funds required to undertake a wholesale investigation and prosecution. At this juncture, Rudolph Spreckels, a rich merchant and banker, undertook to provide the $100,000 required to make a fight for San Francisco's honor. This sum permitted the District Attorney to engage a skilled detective and a brilliant advocate. Thus were obtained the money and the men to redeem the City. The result has been heralded to all the world. Schmitz is in jail, others stand within the shadow of its dark portals; all the little fellows are running to cover and confessing; the rich men have hired the leaders of the bar to defend them. And now—I speak to the gentlemen in South Africa and Australia—it is a curious fact that a large part of the community is taking sides against the District Attorney and those that support him in an effective crusade, because forsooth this Mr. Spreckels has motives for financing the prosecution, the members of it are hired bravos, and the District Attorney himself is merely a puppet. So they say. Just as the Western Federation of Miners and its agents were able to terrorize Colorado and Idaho for twelve years, because there was no strong public opinion in support of the law, and the people of those States looked upon the affair as a vendetta between the mine-owners and the mine-workers, so here in this City of San Francisco the community is inclined to look upon the prosecution of the bribers and the bribed as a contest between rival factions, fighting for office, for spoil, and for franchises. Plenty of opinions are expressed, and there is a tendency for members of this community to take sides as determined by social, political, or financial affiliations. Speaking generally, the camaraderie of a club is more apparent than the civic spirit that makes a City something more than an agglomeration of buildings and car-tracks. What is wanted is a realization of the supreme importance of subordinating private interest to the common good. To us—and we hope to our friends in South Africa and Australia—it is plain that the officers of the law must be upheld, that the official representing this community in the punishment of crime must be supported; at the present moment the only representative of popular government in San Francisco is William H. Langdon, the District Attorney. He is entitled to the undivided and wholehearted assistance, goodwill, and encouragement of every citizen. If he is getting aid from Francis J. Heney, a lawyer that represents the law when so many in his profession are defenders of lawlessness, let us be thankful that his assistant is an advocate so skillful and energetic. If he is getting financial aid from Mr. Spreckels, let us be grateful to the citizen that contributed the funds for so worthy a purpose; if the motives of Spreckels are good, so much the better; if they are bad, he will lose a supreme honor; in any case, his motives are of no consequence. The cause of decency is in the hands of the District Attorney, and no matter what his politics or his other deficiencies, if any, it remains only for every believer in democratic government to support him as the properly constituted representative of the law in this community. Unless we return to first principles, this San Francisco will be as infamous for her politics as she was made famous by an unkindly act of nature. Earthquakes and fires we can face, the effects of them we can overcome, but the corruption of our civic life can end only in the destruction of political liberty and industrial vitality.

A Strike on the Rand.

THIS does not refer to a find of rich ore but to the efforts of labor agitators. It so happens that our correspondents at London and Johannesburg both refer to the incident, and we have also received a letter, published in this issue, from Mr. E. P. Rathbone, late Inspector of Mines for the Transvaal. The general opinion appears to be that the strike is so unjustified as to be certain of failure. Mining on the Rand has had to overcome many unexpected difficulties, industrial and political, and we would be sorry to see a further factor of uncertainty introduced into a business once claimed to be an investment far above all other forms of digging for gold. The immediate result has been to attract attention to the tremendous wages earned by the men that operate machine-drills at Johannesburg. Even to a dweller in San Francisco, where hod-carriers get higher pay than professors at the University, the average of £2 per shift of 8 hours, with a maximum of £4, seems extraordinary, especially when it is followed by a demand for further concessions. And it must be remembered that these men are bosses rather than drill-men, the actual handling of the machine being delegated to Kaffirs or Chinese. We read also that the white men object to bossing more than 25 natives, unless they get more pay. All of which serves but to prove how intelligence can be smothered by greed and, for the thousandth time, that the workman is too often his own worst enemy. At a time when hundreds of stalwart college men are willing to work in the mines at Butte, Bisbee, and the Coeur d'Alene for $3 to $4, it seems queer to read of Europeans that grumble at £2 per shift. And our friends underground in Idaho and Arizona work hard, they do not merely direct the labor of an inferior race, as is done by the white men that are listening so sympathetically to the walking delegate on the Rand. Of course, we are aware that the conditions in South Africa are unhealthy, by reason of the quartz particles in the air of the stopes and drifts, causing silicosis, but the effects are due largely to the disregard for ordinary precautions. Young men, willing to use respirators and take care of themselves, could work for a year or two, at least, without danger to health and could get money and experience in a pleasant way. We shall be surprised if a few capable men do not go to Johannesburg.

Personal.

W. S. NOYES is in Mexico.

H. KILBURN SCOTT is in India.

MARK R. LAMB is at Chihuahua, Mexico.

HERRERT HAAS has returned from Mexico.

EUGENE BRADEN has returned from St. Louis.

FRANKLIN GUITERMAN was in Salt Lake last week.

R. F. GIBSON, of Grants Pass, Oregon, is in this City.

D. D. ROSEWARNE is on his way to Cobalt and Larder lake.

F. LYNWOOD GARRISON is at Los Angeles, on his way to Mexico.

H. C. CALLAHAN has returned to San Francisco from Elk City, Idaho.

E. R. ABADIE, JR., has charge of a mine in Tuolumne county, California.

FRED. H. DAKIN, JR., has left this City to go to examine mines in Siskiyou county.

JOHN A. REID has been examining the Cerro Gordo mines of Inyo county, California.

BERNARD MACDONALD is in New York, where he now has an office at 40 Wall Street.

R. L. LLOYD has returned from Chile to secure a few mechanics for the Braden Copper Company.

H. P. GARTHWAITE, resident director of the Butters Salvador mines and Butters Divisadero mines, is on his way to San Francisco.

ARTHUR H. BROWN has been appointed superintendent of the Lower Mammoth mine at Tintic, Utah, succeeding William Ball, deceased.

FRED. G. FARISH sailed from Genoa on June 5 on his way to the Dutch East Indies to examine mines in Celebes; he will return about September 15.

E. E. CARTER, formerly associated with the Sullivan Machinery Co. as mining engineer, has accepted a position with the Traylor Engineering Co. of New York.

JOHN V. N. DORR has gone to the Black Hills for a few weeks where he will re-open the Lundberg, Dorr & Wilson mill at Terry, and also the new mill of the Mogul Mining Co., at Pluma, of which he has charge as consulting metallurgist.

Obituary.

HENRY G. HANKS, at one time State Mineralogist of California, died at Alameda last week, at an advanced age. He was well known to prospectors on this Coast as an assayer and mineralogist. His son, Abbot A. Hanks, succeeded him as assayer about ten years ago.

JOSEPH CROWTHER died at the Etruscan mines, in Italy, on May 12. He fell down a shaft and was instantly killed. Only 29 years old, he was one of the most promising of the graduates from the Royal School of Mines, where he was a medallist in 1895. He was lecturer in the South Australian School of Mines in 1902. A brilliant career has come to an untimely end.

H. L. SHROM died at Parral on June 12. On the afternoon of that day, Mr. Shrom fell into a shaft at the Palmilla mine, and only lived a few minutes. He and Mr. Cornell (of New York) were together, laughing and talking in a light-hearted way, when he stepped off the edge of one of the many treacherous holes in that mine, and fell a distance of 125 ft. It was the carelessness that often comes with perfect confidence in one's intimate knowledge of danger. Mr. Shrom was a man who won the love and respect of all who knew him. Every one at Parral is mourning his loss, for it is one that cannot be measured. He was a man of high integrity and lofty ideals. He was dearly loved by those who knew him intimately. His body was taken to his home in Greenville, Pa. He was only 36 years old.

Latest Market Reports.

LOCAL METAL PRICES—June 20.

Antimony	22.50@25.50c	Quicksilver (flask)	$38@39.50
Copper	25.75@26.75c	Spelter	7.75@ 8.50c
Pig Lead	5.85@ 6.80c	Tin	43.25@44.75c

METAL PRICES.
By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
June 14	22⅞	5¾	6 7/16	66¾
" 15	22⅞	5¾	6 7/16	67¼
" 16	Sunday.	No market.		
" 17	22⅞	5¾	6 7/16	67⅛
" 18	22½	5¾	6 7/16	67½
" 19	22¼	5¾	6 7/16	67⅜
" 20	22½	5¾	6 7/16	67¼

ANGLO-AMERICAN SHARES.
Cabled from London.

	June 13. £ s. d.	June 20. £ s. d.
Camp Bird	1 2 0	1 1 9
El Oro	1 6 0	1 5 6
Esperanza	1 16 3	1 16 3
Dolores	1 5 0	1 7 6
Oroville Dredging	0 16 3	0 17 0
Stratton's Independence	0 3 6	0 3 3
Tomboy	1 16 9	1 15 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.
San Francisco, June 20.

Atlanta	$ 41	Laguna	1.15
Belmont	3.25	Little Tonopah	.....
Columbia Mtn	37	Manhattan Con	44
Combination Fraction	2.65	Midway	1.25
Daisy	1.20	Mizpah Extension	.....
Fairview Eagle	.....	Mohawk	.....
Florence	3.60	Montana Tonopah	3.00
Gold Bar (Bullfrog)	58	Nevada Hills	4.90
Gold Bar (Goldfield)	48	Red Top	2.90
Goldfield Con	6.25	Sandstorm	40
Goldfield of Nevada	17	Silver Pick	50
Gold Kewanas	61	St. Ives	93
Great Bend	52	Tonopah Extension	1.85
Jim Butler	93	Tonopah of Nevada	15.25
Jumbo	3½	Tramp Con	62
Jumbo Extension	2.00	West End	90

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. June 20.	Name of company.	Closing prices. June 20.
Adventure	2½	Michigan	12¼
Ahmeek	75	Mohawk	76¼
Allouez	42	Nevada Con	12½
Amalgamated	81⅞	North Butte	77¾
Arcadian	4½	Old Dominion	43
Atlantic	11½	Osceola	128
Balakiala	9½	Parrot	18½
Bingham Con	13¾	Phœnix	1⅛
Boston Con	24	Quincy	112½
Butte Coalition	28½	Raven	1¼
Calumet & Arizona	154	Rhode Island	4½
Calumet & Hecla	780½	Santa Fe	2⅛
Centennial	25	Shannon	16¼
Con. Mercur	38	Superior & Pittsburg	14⅜
Copper Range	77	Tamarack	105
Daly-West	15¼	Trinity	21¾
Franklin	12½	United Copper com	62½
Granby	123	Utah Copper	50¼
Greene-Cananea, ctf	15½	Victoria	6¼
Isle Royal	15½	Winona	7
Mass	.....	Wolverine	152

(By courtesy of E. F. Hutton & Co., 490 California St.)

MINING STOCK QUOTATIONS—NEW YORK.

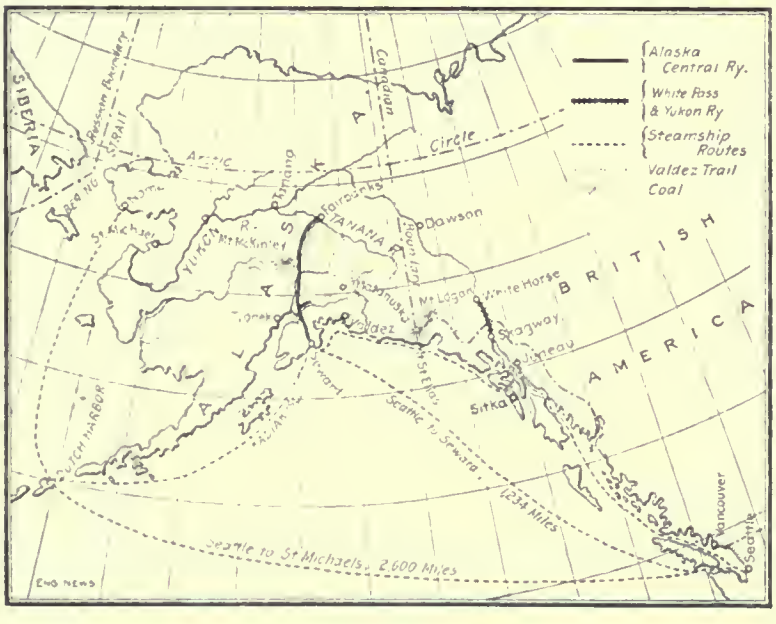
	Closing Prices June 13.	June 20.
Bingham Central	1¼	1⅜
Boston Copper	23⅞	24
Cumberland Ely	8	8
Dolores	6½	6
El Rayo	5¼	5⅜
Guanajuato Con	3¾	3⅝
Giroux Con	8⅞	8¾
Greene Con	26⅛	20
Nevada Con	13	12¾
Nipissing	11⅜	11¼
Tennessee Copper	37¼	37⅛
Tonopah Ex	2	1¾
Tonopah-Belmont	3	3½
Tonopah	15	14⅞
United Copper	64¼	62¾
Utah Copper	25⅞	24⅞

(By courtesy of Hayden, Stone & Co., 25 Broad St., New York.)

General Mining News.

ALASKA.

The annual report of the Alaska-Mexican company, operating on Douglas island, states that the receipts during 1906, for free gold, were $392,773, and for sulphide concentrate, $328,696. The mining expenses were $332,645, milling expenses, $62,200, sulphide treatment charges $25,705, and total expenses $443,100, leaving a net earning of $261,127. Dividends amounting to $216,000, or 24%, were paid and the undivided surplus on hand was $127,123. The average value of the mill tailing was $0.18, and the total gross value of the ore, $3.22 per ton. The mine statement shows 328,627 tons of ore broken, 182 ft. of shaft sinking, 1,760 ft. of rising, 441 ft. of stations and skip-chutes, and 4,857 ft. of drifts and cross-cuts. The mill is equipped with 120 stamps. The ore reserves developed were 856,390 tons, all being below the 440-ft. level.——The first 30 stamps at the Alaska-Perseverence have begun to drop. Parts are lacking for the 20 additional stamps that are in place, so they can not be operated. About 70 men are employed by the company. At the Pacific Coast wharf are eight carloads of machinery awaiting transportation to the mine.——At Whitehorse, there



Map of Alaska.

is much prospecting, and development is proceeding on the Pueblo, Copper King, Grafter, and Arctic Chief properties. A copper discovery is reported at Burwash, 20 miles from White river.——A new compressor, water-wheel, and electric generator have been purchased for the Alaska-Rubicon and the Penn-Alaska companies. Jesse Blakely is the managing director. These claims adjoin the Perseverenee ground. A contract has been let for the Penn-Alaska tunnel, and the Rubicon tunnel will be driven under the direction of C. M. Thorndike.——At Ketchican, small shipments are being made from the Uncle Sam mine, formerly called the White Eagle, to the smelter at Hadley. Shipments are also made from the Hydah, where the gravity surface tram is working smoothly. The Goodro & Thomas and the Polson & Rush properties at Karta bay are showing up well with development. A steamer left last week with 2,600 tons of Mt. Andrew ore, and another with 1,000 tons of Rush & Brown ore from Karta bay.——A strike is reported from the Niblack at the bottom of the shaft, on the 300-ft. level. The daily output of the Mamie is being gradually increased, and also that of the Mt. Andrew and Stevenstown. The Mt. Andrew is shipping at the rate of 4,500 tons per month, while the Stevenstown sends about 100 tons per day over the tram to the Hadley smelter.——Two thousand tons of ore from the Jumbo are awaiting shipment. ——The smelter at Hadley will shut down temporarily on account of a shortage of coke.——At Valdez much development work is being done. La Touche Island Copper Mining Co., which is handling the property acquired by George Barrack and James Girdwood, has a wharf completed and a tramway equipment on the ground. Over 500 tons of ore are on the dump and shipments will start within six weeks.——Some rich float copper ore has been found on the property of the Singer Mining Co., on La Touche island. ——Some good copper ore has been discovered at Long bay, just below Glacier bay. Huie Goodell and W. A. Johnson made the strike.——The Hogan bay property of the Happy Jack Mining Co. will soon be in shape to ship ore. In Mummy bay, this company has a group of six claims, on which a tunnel has been run for 150 ft. A copper strike is reported from Knights island, but details are lacking. The tramway from the Standard Copper mine, at Landlock bay, to the beach, will be completed in a few weeks.

The United Mine Workers of the Tanana, to the number of 3,500, are still out on a strike for an eight-hour day. They are warning all union men to keep laborers away from the district in order that they may win the strike.

ARIZONA.

GILA COUNTY.

The Gila County Copper Co. has been shipping a large amount of concentrate to Globe. Most of the milling ore was stoped in the San Juan mine, although other claims are looking well. An orebody 28 ft. wide was encountered on the 230-ft. level, which easily keeps the mill running.

GRAHAM COUNTY.

The output of the Shannon company for May showed an increase, being 720 tons of bessemer copper. This company will probably average about 700 tons per month throughout the year. The foundation for a new furnace has been completed.——The output of the Arizona Copper Co. for May was 1,380 tons of bessemer copper, a slight increase over the production of April. The plant has been overhauled and the property is now in good shape. The company has recently built several large shallow tanks in which the fine material from the leacher and the slime from the concentrator are impounded and settled. The fine from the leacher runs well in copper and is mixed with flue dust and run through the converters, while the slime from the concentrator is used at the smelter for a converter lining. This treatment is expected to effect a good saving, as the material was formerly dumped into the river.

MOHAVE COUNTY.

A mill will be built at the Oro Plata mine, of which John Boyle, Jr., is the superintendent.——Work will be resumed on the Victor-Paymaster mine. Fred N. Chandler has just completed an examination of the property.——Plates have been put in the Vanderbilt mill at Corbat, which give good results with the oxidized surface ores.——The Keystone mine is being unwatered so that an examination of the property can be made. This mine was worked over 30 years ago.——In the San Francisco mine at Cedar, water was encountered in a drill-hole on the 600-ft. level, under so great a pressure that it has been piped to the surface and flows into a tank that supplies the mill with water.

YAVAPAI COUNTY.

(Special Correspondence).—Another shift was put at work on the Black Hills group at Jerome this week. The work will be pushed as rapidly as possible to tap the outcropping vein. At the Mingus Mtn. property, preparations are being made to ship a little ore to the smelter for a sample run. This property is showing up some excellent ore as development proceeds.——At the Little Daisy mine, the work of cutting a station has been commenced, and a pump will be installed and the shaft continued down. The property is a

most encouraging one.——J. J. Shaw, president and general manager of the Mazatzal Copper Co., is in the Tonto Basin country at present, looking over the company's property there. Encouraging reports continue to come from this mine, and 20 men are employed. The Verde Grande Copper Co. has a shipment of machinery coming from Los Angeles that will be the largest plant yet brought into Jerome for development purposes. At the mine, sinking with three shifts is being continued with good results. This property is developing at a rate that is a great surprise to many.——A party of mining men from Los Angeles visited Jerome the past week to look at the property of the Jerome Mines Development Co., one of the Haynes holdings, known locally as the Harryhousen group. They were well pleased with the property.——Charles Knutson was in Prescott from the Sycamore mine this week and reports that his company is cutting a station in the shaft in which they will install a pump, after which they will continue to sink.——At the Arkansas & Arizona, work on the shaft is being prosecuted with all the vigor possible, with the best of machinery and skilled workmen.

Phœnix, June 15.

YUMA COUNTY.

(Special Correspondence).—The Harqua-Hala mill is running steadily and making monthly clean-ups that are satisfactory to the owners.——The Ironwood & Arizona Development Co.'s shaft is down 275 ft. Faster progress is being made since the installment of the gasoline hoist. The altered ores are giving way to copper sulphides.——The Hercules mine has passed beyond the prospect stage and is well equipped with a pipe-line, steam-hoist, and machine-drills.——The San Marcus group of the Pittsburg-Harqua-Hala Co. promises to make good. A body of high-grade shipping ore has been encountered on the 450-ft. level.——The shaft on the Oro Cobre, which has attained a depth of 245 ft., shows a body of copper sulphides its entire width. Only by cross-cutting can the full size of the orebody be ascertained. The increasing inflow of water makes it necessary to replace the whim with a steam-hoist. The vein showed fairly well on the surface, and did not improve much as depth was attained, until the permanent water-level was reached.——J. W. Boone is working the Cunningham mine and is making regular shipments to the Humboldt smelter. The ore runs about $100 per ton in copper and gold.——Josephi & Wilkinson have bonded their group of claims to Eastern parties.——The Victor & Bell Crown Mining Co. has concentrated its work on the Bell Crown No. 3. They reeently let a shaft contract of 100 ft., which will when completed reach the 250-ft. level. The vein is about 5 ft. wide and shows about 3 ft. of ore at a depth of 150 ft. Shipments made to the Humboldt smelter gave net returns of $128 per ton in copper and gold. When a steam-hoist is installed regular ore shipments will follow. The Bell Crown No. 3, Ora Cobre, and Copper Bullion are all on the same line of contact. The ore throughout lies next to the diabase dike forming the hanging wall, and in the lower workings alteration of the dike is noticeable.——The Bunker group of claims, which are bounded on the east by the Ora Cobre and Copper Bullion, was sold last week to Bisbee parties.——The Montana & Arizona Co. has just received a 60-h.p. gasoline hoist to replace the 12 h.p., with which they succeeded in reaching the 400-ft. level.

Salome, June 10.

CALIFORNIA.

AMADOR COUNTY.

About 60 men are working at the South Eureka mine, at Sutter Creek. Experienced miners are scarce and this company is constantly on the lookout for more men.

BUTTE COUNTY.

A party of shareholders is inspecting the Gold Bar Mining Co.'s property, where it is intended to work a series of dredges.——Deposits of chromium and iron are reported as having been found on Middle Butte creek, by S. E. Starrett. The chromium carries some nickel.

EL DORADO COUNTY.

A contract has been let to A. B. Eastwood to sink the Scherrer shaft 200 ft. deeper.——Work is progressing on the new Vivian mill. Jay Sawyer is in charge.

INYO COUNTY.

News comes from Bishop, that S. P. Roberts has sold the Golden Gate and St. Louis groups of claims at Pine Mtn., to W. J. Nelson, of Los Angeles. These groups include 25 claims, situated 20 miles east of Laws, and near the Index group. C. H. S. Morris is the superintendent.—The Inyo Mines Syndicate will begin work on the Red Rose group. The road to the mine is being put in shape.——Two carloads of ore were shipped last week from the Lucky Jim mine at Darwin.——Oglesby & McDonald have just completed examinations of the Black Canyon mine, and the Reward property near Independence.——W. D. Clair has purchased the Stone & Pendry claims in the Sherwin district.

NEVADA COUNTY.

A force of men has been employed at the Norambagua, cleaning out and retimbering the old tunnel, in preparation for a visit from shareholders from Pittsburg, who are coming to inspect the mine.——The Dolly Madison G. M. Co. has made the final payment on the claim which it has under bond from S. W. Weeks, of Randolph Flat. This ground adjoins the Hay claims.——An assessment of 5c. per share was levied at the recent annual meeting of the Zeibright Mining Co. The directors elected were Fred Searls, William Giffin, Alex. Hongel, J. J. Jackson, W. F. Englebright, and James F. Colley. The reports from the mine are encouraging, and development work is proceeding.——The Conlan mill of 10 stamps has started, and a quantity of ore has been developed. The Lafayette and Comet claims have recently been purchased by this company.——The antimony deposit on the Johnson property will be explored by L. C. Heler, who will run a tunnel in on the vein.

SHASTA COUNTY.

One of the two furnaces of the Bully Hill smelter has been torn out, and the converters have been removed, preparatory to remodeling the smelter. About 100 men are employed on repairs and in the mines here and at Copper City. The company has let a contract for burning a large kiln of brick.——At Knob, the Midas company has its new hoist in operation, and is putting on all the miners it can get.

SISKIYOU COUNTY.

A new hoist has been ordered for the Yellow Butte company, operating in the Butte district. J. D. Ball is the manager.——Work has been started on the Daggett gravel claim on the Klamath river. A new method is used, the gravel being hauled up by a steam scraper on an incline, somewhat like a bucket dredge.——A small force is employed at the Golden Eagle mine. W. Baker is the superintendent, with Ed. Baker in charge of the mill.——A force of 10 men is working in the Quartz Hill mine, at Scott Bar. L. D. Crawford is the superintendent.——Lewis & Boyer have bonded their mine below Fort Jones, to a Colusa company.——Work has been resumed at the McFadden & Champion mine, near Callahan, which was forced to close last winter on account of the heavy snow. This property is under bond for $45,000.——The first carload of ore has been shipped from the Dr. Maggi mine, near Callahan, to the Kennett smelter. A wagon road has been completed to the property.——The Vulcan Copper Co. is building a road to the Uncle Sam mine, in order to take a diamond-drill and machine-drills to the mine. About 10 men are employed at the mine.

TUOLUMNE COUNTY.

Negotiations are on between Louis Rosenfeld, of the Eagle-Shawmut Mining Co., and T. S. Bullock, which may lead to the leasing of the Yosemite Short Line railroad between Jamestown and Shawmut, a distance of eight miles.——Sinking has been discontinued in the Clio mine, and a station is being cut at the 650-ft. point, preparatory to running a cross-cut.——F. B. Keever, president of the Lion Mining Co., announces that J. F. Parr will succeed J. L. Bryson as superintendent of this company.——Oakland parties are trying to get hold of the Pereira mine, near Jamestown.——The old shaft at the Confidence mine is being unwatered in order that work may be continued in the new shaft, into which the water has found its way.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Main Gulch company is meeting with great success in its operations on the Smuggler mine, above Silver Plume. The shaft is down about 250 ft. In the third level west a fine vein of ore from 10 to 18 in. wide has been opened up for 75 ft.; shipments of this ore have returned 200 oz. silver per ton. There are now three sets of lessees at work in the mine. Erickson & Co., working on the third level east, are shipping regularly ore that averages 86 oz. silver per ton. At the fourth level the drift is being run east to come under the ore-shoot in No. 3 level. The shaft will be sunk another 75 ft. and drifts run east and west. C. I. Burt, of Silver Plume, is in charge of the property.—— The Scotia M. & M. Co., operating the Scotia & Maine lodes, on Sherman Mtn., and the Scotia mill at Silver Plume, has driven through the porphyry dike which cut off the vein and caused the suspension of work in the mine several years ago. After driving 40 ft., a vein of lead ore was encountered from 16 to 20 in. wide, and a heavy production should result from this discovery, as the ground ahead is all virgin.—— The Muscovite Mining &

Map of the New Mining Districts of Nevada and California.

Leasing Co., recently incorporated by Denver men, has purchased the Dewey tunnel-site from E. E. Grubb. The property consists of a tunnel-site 3,000 by 3,000 ft., and 40 lode mining claims on Alpine Mtn. This district has been very little prospected, owing to the deep slide. Work has been started on the tunnel-site and important discoveries are looked for. The same company has started work on the West Muscovite property, on Democrat Mtn., where there is a good vein of lead ore opened up, 18 in. to two feet wide. This is now being driven upon, and stoping will shortly be commenced.—— Chas. Estelle & Co. have taken a lease and bond on the Whig property on Democrat Mtn.; the main adit has been cleaned out and re-timbered and is in a distance of 110 ft. There is a 12-in. vein of lead ore in the breast which assays 8 oz. silver, half an ounce gold per ton, and 40% lead. This property has been lying idle for over 30 years. The lessees are now driving the adit ahead.—— The Linn Consolidated M. & M. Co., of which W. C. Hood and Frank A. Maxwell are the local representatives, operating the Mineral Chief and other lodes on Democrat Mtn., has now large bodies of smelting and concentrating ore opened in the eight levels of the property. With a view to most economically handling the ore, the company decided to erect a mill close to the C. & S. R. R. tracks below Georgetown, with a wire-rope tramway from the mine to the mill. The masonry-work for the foundation of the mill is now nearly completed, and work on the tramway will shortly be commenced. The tramway will be 1,000 ft. long and is to have a daily capacity of 75 tons. When the mill is completed the output of the camp will be largely increased, as the ore reserves in the mine are extensive.—— The East Argentine company has encountered, in the Sydney adit at a distance of 2,050 ft. from the portal, the footwall of what is proving to be a large lode, as 40 ft. have now been driven across the vein without striking the hanging wall. The whole lode is heavily impregnated with mineral. The Sydney adit is situated about five miles above Georgetown, on the East Argentine wagon-road, with every facility for easy transportation of ore. The machinery is run by water-power. M. Sydney is the manager.——C. E. Carpenter is in charge of the operations being carried on by the X-Ray Gold Mining Co., which has a lease and bond on the Doric properties on Saxon and Griffith Mtn. Men have been putting up a raise on the Cram lode, cut in the Doric adit at 2,450 ft. from its portal and some 2,000 ft. below surface. At about 100 ft. up, a fine vein of lead ore with copper pyrite has come in, which on this mountain always runs well in gold and silver.—— It is rumored that a smelter specially adapted to the ores of Clear Creek county is to be erected near Denver, with George G. Vivian as superintendent.

Georgetown, June 15.

SAN JUAN COUNTY.

A good copper strike has been made by M. T. Chestnut in the Carbon Lake mine at Red Mtn. The discovery was made in the 200-ft. level.——The Hercules Consolidated mill is about ready to start. The mill is equipped with two coarse crushers, 40 stamps of 800 lb. each, eight jigs, 18 Wilfley tables, and amalgamating plates. Thomas H. Kane is the general manager.——The Herbert Smith group of 10 claims, in Cinnamon gulch of the Animas Forks region, is being developed. About 50 prospecting pits have been sunk on the outcrops.——The cross-cut of the Silverton Mining Co. is being driven rapidly. It is expected that the Belcher vein will soon be cut.——The Precious Metals Mining Co. has let a contract to Jesse H. Kramer for 500 ft. of tunneling.——The Grand Mogul mill is running. The jig-capacity has been increased from 100 to 200 tons per day.——The Ross smelter is producing two carloads of copper matte per week.——The output from Silverton for May was 3,942 tons of crude ore, matte, and concentrate.

IDAHO.

IDAHO COUNTY.

E. O'Shea, of Spokane, holds the American Eagle mine, near Elk City, as trustee for the creditors of the American Eagle Mining Co., having bought the property for $15,000 at a foreclosure sale. It is understood that the creditors' claims amounted to $25,000. The property represents an outlay of $40,000 on their part. Mr. O'Shea says that the American Eagle Mining Co. has virtually gone out of existence, and the property has passed out of its hands. He has leased the dumps to Patrick Brennan and J. B. Honniger, and they have started the 10-stamp mill and are working over the ore. Their operations will last four months. Beyond that, there are no definite plans. The property has been idle two years on account of litigation among the stockholders.

It is reported in Spokane that work will be begun at once on a 1,000-ft. shaft on the Concord property in the Buffalo Hump district. The properties are controlled by Boston capitalists. Work was suddenly suspended on the company's properties after all of the winter's provisions and supplies had been laid in last year. This action was the cause of much speculation among mining men, as it is known that the company is well backed financially. Now rumors are current that the backers of the Concord have been working on a plan for the consolidation of the most promising properties in the district, outside of those controlled by Charles Sweeny, of Spokane. The big merger will include the Jumbo, the Crackerjack, and several properties on Mineral hill.

OWYHEE COUNTY.

Since the flood of water has abated, the work of reopening the adit on the shaft-house level has been resumed. The south drift on No. 2 level is being driven, and the face is in the ore-shoot that was encountered in the No. 1 level above. ——In the Village Blacksmith, a station has been cut and a shaft started 360 ft. from the portal of the tunnel. Good ore is showing in the bottom of the shaft, and the mine will produce steadily.——Many of the Banner stockholders from St. Paul and Minneapolis have visited the property during the last two weeks.

SHOSHONE COUNTY.

(Special Correspondence).—Work has been resumed with an electric drill on the West Hecla mine at Burke. It started 50 ft. in the tunnel that is being driven on the vein and will have to proceed 1,200 ft. before the ore is reached. This will be at a depth of between 800 and 1,000 ft. The development is being done under the direction of Arthur McCallum, formerly superintendent of the Standard mine

The Coeur d'Alene, Idaho.

at Mace. Three shifts will be placed at work.——Articles of incorporation of the Buckeye Copper Mining Co. have been filed at Wallace. The incorporators are S. P. Fairweather, W. Clayton Miller, C. W. Gibbs, E. F. Hall, John Benedict, L. Ryson, and T. S. Plummer. The capital is 1,500,000 shares of 25c. each. The company will develop a group of nine claims adjoining the Bullion property near the Idaho-Montana divide.——The Silver Mountain Mining Co. has been incorporated at Wallace, with a stated capital of $1,500,000. Directors and officers for the first year are: President, Joseph H. Astin, Gem; vice-president, Samuel T. Tennal of Mullan; secretary and treasurer, Joseph S. Pierson, Wallace. In addition to these Abe Wyman and E. Lindsly of Mullan are directors. The company will develop the Silver Mountain, Empire, Cyclone, Tornado, and Mill Dirt claims in the Hunter district.——The vein on the Coeur d'Alene Lead Silver Mining Co.'s property has been cut and is now being driven on. L. M. Porter, the manager, says it is three feet wide, and consists of quartz heavily mineralized with iron and lead. The strike was made 300 ft. from the portal of the lower tunnel. The property consists of four full claims between Wallace and Mullan, that are being surveyed for patent by M. L. Baldy of Wallace.——The Hornsilver mine on Placer creek, two and a half miles north of Wallace, is a low-grade gold proposition, according to assays recently made. A vein 150 ft. wide has been opened and a ton of ore has been taken from the lode, 100 lb. being taken at intervals of two feet from 40 ft. of the vein. This gave average assay returns of $4.80 per ton. A similar test was made of the other 110 ft. of the ore, which averaged from $1.50 to $1.60 per ton in gold.

L. McNeill announces that if mill-tests prove satisfactory a reduction plant will be installed.——Charles Sweeny, president of the Federal M. & S. Co., announces that the company has secured an option on the stock of the Nevada-Stewart company, with property on Pine creek. The Federal has been trying to get control of this property, together with the adjoining claims, for some time, and it was reported at Wardner that the Highland Chief and Surprise were included in the deal. The option holds for a year. Al Page, who represented the Sweeny interests in the deal, recently made large purchases in the Surprise and the Nevada-Stewart and secured the option on the latter in this way for the Federal company.——A three-foot orebody carrying values of $36 per ton was recently exposed in the 600-ft. tunnel on the Advance mine near Mullan. The silver runs $2.50 per ton, and the copper 6.5%. The ore is unusual in that it carries free gold visible to the eye. The property consists of five claims on Snowstorm hill.——Sinking on the first shoot of ore has been begun on the Vienna International mine on Placer creek, near Wallace. The mine has been equipped with machinery and at the point where the station has been cut and the winze started, the orebody is eight feet wide and nearly all of shipping quality. Stopes have been opened on the same ore-shoot between the two tunnel levels and some ore has been sorted and sacked for shipment. The upper tunnel has been extended to open the second vein and has cut the lode to a distance of 20 ft., with no sign of the hanging wall in sight.——Arthur A. Lewis, secretary and treasurer of the East Hercules Mining Co., reports that development is progressing, although only a small force is employed and the work is all done by hand. They are driving the cross-cut tunnel and have gone 127 ft., estimates showing that they will have to go 70 ft. further to strike the vein. A contract will be let for that much additional work in the cross-cut.——A certificate of increase of capital has been filed by the Bullion Mining Co., at Wallace. The capital has been increased from $1,000,000 to $1,500,000. This was authorized by a vote of 721,163 shares against 26,000. The proceeds will be directly used in the development of the mine.——George W. Ruggles, who holds a $60,000 option on the V group of claims on Pine creek, near Wardner, announces that work will be begun at once on a 1,250-ft. tunnel, which is believed will get under the surface outcrop of the vein. Some good galena ore has been found.

Spokane, June 15.

MISSOURI.

JASPER COUNTY.

The framework has been finished for the new 50-ton mill of the Deacon mine in the Richland Valley district, near Duenweg. The mill is on the south side of a 120-acre lease owned by the Trinity Zinc-Lead Smelting Co. J. P. Powell is general manager.——Just south of the Trinity property, the San Gabriel company has a new 500-ton mill. ——At Webb City, the Mercantile Metal Mining Co. has let a contract with the Southwestern Bridge Co. for a new 250-ton mill, to be built with a steel framework.

MONTANA.

BROADWATER COUNTY.

The Keating and Blacker mines are under lease and bond to the A. S. & R. Co. of East Helena. This company has spent over $100,000 on improvements, and produces from 30 to 50 tons of ore per day, which is hauled to Toston and shipped by rail to Helena. The company employs about 75 men and the shaft is down 335 ft.——The Simpson Mining Co. has a shaft down 180 ft. and ships about one ton per week of high-grade gold ore.——The Ohio Mining Co., owned by Mrs. Keating of Helena, has been a great producer.——This camp is provided with a 10-stamp custom mill.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—Activity at Nob Hill has been pronounced. The Silver Legion company has resumed work in its old workings, and in the east drift on the 850-ft. level, ore has been struck. In an 18-in. streak there is wire and native silver, and some gold. The ore is being sacked and about 20 tons are ready for shipment. It is estimated that 250 tons can be produced within the next six weeks.——Development on the Eldorado Sphinx, east of the Legion, has brought to light some ore. In a winze in the Sphinx tunnel, a body of ore has been uncovered at a depth of 55 ft.——The width of the vein will be determined at the 100-ft. level, where cross-cutting will be done, and a raise put through to the surface. This is the first effort made to work the Sphinx for several years, owing to lack of money. Water has been developed and the property is in good shape. This is one of the mines worked 50 years ago by the chloriders.——A. K. Wright, of San Jacinto, has taken over the Jumper group of five claims. The property is developed by a 28-ft. shaft, from which some ore has been taken, and lies just south of and parallel with the Silver Legion, and adjoins the Eldorado Sphinx. A force will sink the shaft 100 ft. when driving will be done.——W. A. Miller has arranged to have 100 ft. of sinking done in the shaft of the Searchlight Belle, and it is expected this work will bring the shaft to the water-level.——The east drift on the Fortuna is being driven to connect with a shaft sunk on the vein 200 ft. east of the main workings, and as soon as this is completed the stoping ore between the 200-ft. level and the surface will begin. Extreme hot weather makes the workings warm, and until this additional air passage is opened only driving can be done.——A. A. McKnight is the manager.—Twelve men are employed, and this force will be increased and work continued throughout the summer.——Development on the Eldorado Consolidated has brought in a vein carrying pay-ore, and indications are that this property will show ore similar to the Daisy Bell, but a short distance away. A shaft is being sunk and driving will be done on the 100-ft. level.

Searchlight, June 12.

ESMERALDA COUNTY.

(Special Correspondence).—During the week just ending, 1,624 tons of ore, with an estimated value of over $200,000, was shipped fr m the Consolidated, Florence, Jumbo Ex., and Quartzite properties. Only the high-grade ore is being shipped.—— Several of the smaller companies and lessees have been compelled to suspend operations on account of the scarcity of money to pay off the men, and finance necessary development. With the exception of the more important mines, very little work is being done. There are more idle men here than there have been for months. From present indications the summer will be dull. The San Francisco strike, and the unsettled condition of the financial markets, are regarded as the chief cause of the depression.

Goldfield, June 15.

The quarterly report of the Goldfield Consolidated Mines Co., which has just been issued, shows that the funds in the treasury of the Consolidated and the constituent companies amount to $1,400,339. In addition to that sum, the bullion produced in May from the Combination mill amounts to about $119,000, making the total reserve $1,519,339.——With the financial report the manager of the company sends out a report regarding the general condition of the properties. From the report it appears that between February 1 and June 1 the underground development of the company has amounted to 3,536 linear feet and 135,121 cu. ft. in drifts, cross-cuts, and raises; 61,000 cu. ft. in stopes and 335 linear feet in shafts.——Sinking has continued in the Mohawk and a new level has been started at a depth of 450 ft. An additional hoist has been ordered and will soon be in place to continue sinking. This will allow the present hoist to work at its full capacity upon development and production in the levels now established. At the 450-ft. level the east cross-cut has passed through the main vein and drifts both north and south are in ore. On the 250-ft. level the orebodies left standing by lessees are being made available by new connections.—— Since February 1 the Combination mine and mill have been in operation only 68 days, so much time having been lost on account of labor controversies.——Some improvement in the mill practice has been made within the last four months, as a reference to the extraction for the quarter ending December 31, 1906, and the quarter ending March 31, 1907, will show, the indicated extraction for April and May being 95.5%, as against 85.6% for the quarter ending December 31, 1906. The present indicated extraction will probably be reduced to 94% by the smelter discounts on concentrate shipments, such discounts being the difference between what is paid by the smelter per fine ounce and $20.67 as paid by the United States mint.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The lower adit on the Gwin mine, at Covada, is in 345 ft. and has interseeted the main vein, 20 ft. in width, at a depth of 300 ft. vertically and 500 ft. on the pitch. The ore assays 9% copper, with $2 gold and 41 oz. silver per ton.——The adit on the Meteor mine, driven 630 ft. to the intersection of the first vein, will be driven about 40 ft. further, to cut another, which parallels it at the surface. The first vein cut is five feet wide, has a very rich streak, from four to 18 in. wide, on the foot-wall, and averages from $16 to $40 between walls. Gold predominates. A sorting-house has been built, and an ore-bin will be attached to it.——The Seal Mining Co. has purchased six claims on Bridge creek, covering a contact vein, from 40 to 60 ft. wide, between porphyry and diabase. It is traceable for 1,000 ft. The vein is iron-capped and has been tapped by an adit, driven 57 ft., at a depth of 30 ft., where the ore assays 49% copper and $2.20 in gold. A new adit will be started on the vein, which will gain a foot in depth for each two feet driven for a distance of 1,500 ft. Articles of incorporation have been filed for the Seal Mining Co. ——Articles of incorporation have been filed for the San Poil M. & E. Co., who will develop three groups of claims on the south half of the Colville Indian reservation. The directors of both the Seal and this company are Caspar Howarth, of Chester, Pa.; S. L. Boyer and A. L. Wright, of Spokane; John W. Mickle, Charles E. Skiles, and Mr. Hannaford, of Philadelphia, which is the principal place of business. The most important of the three groups is the Last Chance group, in which are 10 claims, situated at the heads of Nine Mile and the south fork of Bridge creek. The other groups are known as the Empire and Philadelphia. Some of the veins are iron-capped. The little work done by the original owners has exposed good silver-lead ore, chiefly carbonate.

Republic, June 8.

The Bortle Copper-Gold Co. has just purchased ground at the foot of Curlew lake, from Henry Zimmerman and Anna E. Kinney. It is reported that the company will build a railroad to Belcher, and erect reduction works on this new ground on Curlew lake.

STEVENS COUNTY.

(Special Correspondence).—A shaft on the Nellie S. mine, on a contact vein between granite and limestone, has developed ore which assays about $35 per ton in gold and copper, at a depth of 15 ft. The vein is eight feet wide. The main shaft was sunk 200 ft. on a four-foot vein; the newly discovered vein is 200 ft. west of, and dips toward, it. A cross-cut will be driven from the bottom of the main shaft, to intersect the eight-foot vein. This property is situated near Chewelah. The Viking Copper M. Co. has been incorporated to develop three gold-copper claims in the Pierre Lake district, by J. A. Maieil, P. Milkark, and G. H. Walters, of Spokane. The ore assays from $8 to $40 per ton.——The Wild Rose and Buckeye claims, on First Thought hill, have been sold to the Trophy Gold M. & M. Co., a new corporation.——Work has been resumed on the Trojan mine, in Pierre Lake district.

Republic, June 10.

Special Correspondence.

Chihuahua, Mexico.

Mining News From Parral.—Sale of Mines.—Active Exploration.—Shortage of Cars.—Prospecting All Over the State.—Branch Railroads.—New Silver-Lead District.—New Electric Plant.

Manuel Cameros has purchased the Mexicana property, situated on La Colorada Mtn., and has located all of the ground surrounding that property. The price of the Mexicana is said to be $100,000. The Vesubio, owned by General Zermeno and situated north of, and close to, Parral, is said to be under lease to Parral parties, who have already started work on the property and have taken out some ore running high in both lead and silver. The San Viciente Ferrer, owned by Carlos Guimbarda, and about a kilometre north of Parral, is reported sold to Denver capitalists.——In the Lamente district, Charles Sewell is working a force of men on the Lamentos mine for a company composed of himself, Luis Terrezas, Jr., S. Robinson of Chihuahua, John R. Allen of New York, and J. F. Johnston of Parral. Mr. Johnston has also taken out men to work on the Labrador, in the same camp.——The Cienega de Olivos is still attracting much attention, and many new denouncements are being made. The Delifina of that camp has made another shipment of ore running 24%, and 600 to 700 gm. silver. ——The Americana mine at Terrazas is reported unwatered, and will soon be extracting ore.

H. E. Thompson, of the San Salvador mine, in the Parral district, says that he has sufficient showing to warrant the installation of a complete machinery equipment at that mine. The Benito Juarez, close to Parral, is now said to be in good ore, and the work is being pushed as rapidly as possible. The Terrazas smelter people are working the La Maria mine, which adjoins the Rio Tinto, and are taking out about 200 tons of low-grade copper ore per month. The Tekamah, in the same district, is being developed by G. A. Lord and associates, of Boston. It is reported in Parral that the big Refugio mine is soon to start up, under the management of Phil Robertson. The shortage of cars is still causing much delay and trouble in ore shipments, and the promised 'better service' of the Mexican Central seems to be yet far away. Mr. Voorhees has leased the Las Vegas to S. Lawrence and associates for a term of years, the lease to go into effect the first of June. The deal for the Justicia mine has been closed, and the first payment made. The new owners intend to get a steam hoist and pump on the property as soon as possible, and commence work at once. All over the State of Chihuahua, but especially in the district east of Chihuahua, a good deal of prospecting is being done, principally for copper and zinc.

The Hines Consolidated Mining Co., which recently purchased the Clarinas and La Reforma group of mines, has completed the survey for the branch railroad that they propose to build from Santa Barbara to the mines.

Map of Mexico.

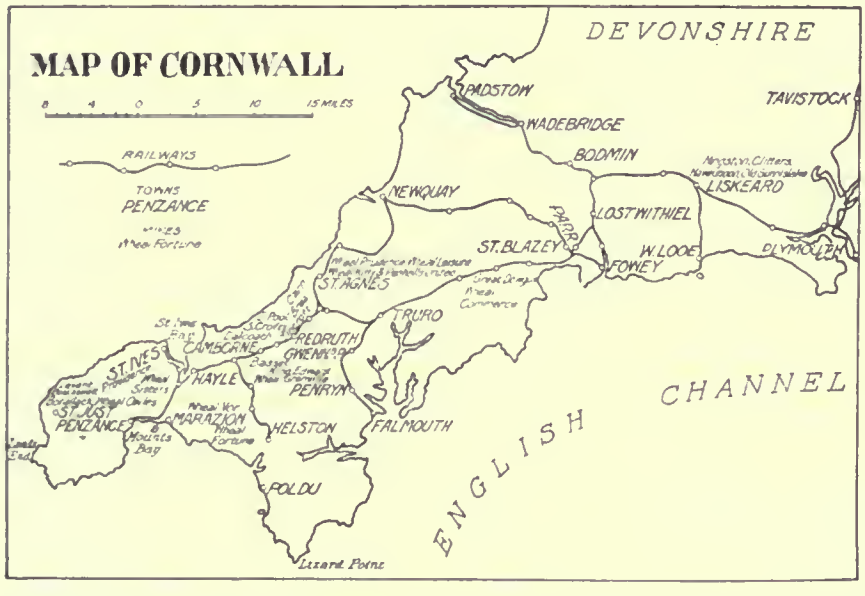
A special train of the stockholders passed through Parral on their way to Santa Barbara recently to look over the holdings of the company. It is rumored that this company is now in negotiation with the Hidalgo Mining Co. of Parral for all of the holdings of the latter.

The Mexican Mines Corporation is the name of a new company that has recently taken over several properties in the Almoloya district, and has started the sinking of a three-compartment shaft. The company's headquarters are at 25 Broad St., New York, and the company is said to be capitalized at $3,500,000. C. L. Graves is general manager, and W. D. Pearce is resident manager. E. J. Ernest is mine superintendent.——The mill on the Santa Barbara mine, belonging to the Rio de Plata Mining Co., is now completed, and will soon start up. The Mack Mining Co. is now working a property adjoining the Conchello, which was recently sold to the Green Gold Silver Company.

A new lead-silver camp has recently been opened up about 60 miles northwest of Parral, near Pillar de Concho, on the Conchos river. This is an old camp,

active about fifty years ago.——The McCausland Mining Co., operating the Los Bronces in the Santa Barbara district, has recently taken an option on several properties adjoining this mine, and expects to start work shortly.——The Cigarrera people, of the Almoloya district, are now laying track on their spur from Baca station, and are trying to get this work completed before the rainy season. This district has recently shown much activity, and at the present time there is much exploration work in progress.

W. F. Tye, electrical engineer for the Canada Electric Syndicate, has been looking over the Parral district, making arrangements for contracts. This company intends to put in a dam on the Conchos river at a place called San Nicholas de la Joya, and erect a plant that will develop 2,500 h.p., so as to furnish Parral and surrounding camps with electricity.——The Gran Bretaña has lately struck good ore on their 300-ft. level, which is also the water-level. They have now about 400 ft. of drift, and are driving both north and south. The vein is 6 ft. wide, and the ore is divided into two classes, one



running 1,800 gm. silver, with 40% lead, and the other giving 1,000 gm. silver, with 10 to 15% lead. They are now working 25 men, and expect to soon begin shipping, but only the ore taken out during the development of the property. C. F. Gerhardt, the superintendent, states that it is the intention to sink the shaft another 100 ft. Electric plunger sinking pumps have already been purchased, and are now on hand. This property is three miles north of Parral.

The Buen Viento is again in operation. A 15-h.p. electric hoist has been installed, and about 25 men are at work. A cross-cut from the 327-ft. level is being driven to cut the San Cristobal vein at a depth of 700 ft. This property is north of, and close to, the Palmilla.——The San Cristobal mine is now shipping a car of ore per day. The winze on the 300-ft. level to the south of the shaft, is now down 155 ft., with drifts both north and south at the 75-ft. and 125-ft. levels. This winze has been sunk entirely in a new ore-shoot, and has opened up between 6,000 and 7,000 tons of ore running about 1,000 gm. silver per ton. At the present time they are stoping at the 75-ft. level of this winze. An electric 15-h.p. hoist has been installed at this winze, and it is the intention to sink to water-level, and further develop this shoot of ore. The vein is from five to six feet wide. This mine now employs about 50 men; it is about three miles north of Parral. The Chinaca mine, owned by James E. Hyslop and associates, is now being steadily developed. This property is not far from the Azules camp in the Santa Barbara district. Work has recently been started on the Zapoteco property, owned by Hamilton and associates of Parral. This property is close to the La Perla group, about six miles north of Parral.

London.

A Stagnant Stock Market.—British Consols.—Labor Troubles on the Rand.—American Mining Shares.—Cornish Optimism.—Oroville Dredging.

Regarding the past fortnight (which includes the Whitsun holiday), the financial press is unanimous in describing the prevalent conditions in the stock market as having been mainly either a near approach to utter stagnation or more or less acute depression. Investors have continued to hold aloof, at all events as buyers; while those who have come forward as sellers have found prices slipping away persistently. Writers have not failed to notice that the price of £84 2s. 6d. touched by Consols was the lowest quotation for the premier security since 1848, and that only once since then has the price approached nearly to 84. It must be remembered, however, that the rate of interest is now only 2½%, whereas then it was 3%. But it is remarked that those were times of severe financial crises of a character quite lacking on recent occasions. It is said that a Stock Exchange man with nothing better to do, occupied himself one day in roughly collecting the views of his fellows as to the cause of the present disastrous state of affairs. This is the list of troubles he had to jot down: Closing of weak bull accounts, iniquitous income tax, radical government, socialistic propaganda, labor troubles, unrest in India, fear of gold exports to France and America, more sellers than buyers, weather, generally false markets, slump in Wall St., good trade, too many aliens in England, free trade. A more weighty observer, the head of a great banking house in Lombard St., states: "There can be no doubt that the policy of the Government has given rise to serious uneasiness, for nobody can tell what line they intend to pursue." Taking up the parable against our present political masters, a 'surveyor' quoting from his own experience, shows that the "entire investment market is suffering from a Radical frost." In these circumstances, the gloomy appearance made by the last mining making-up list is not at all surprising. As to South African shares, it is pointed out that although lower all round than at the last preceding settlement, these have suffered rather less than might have been expected; for, in addition to the doubts still entertained as to what may be the ultimate decision of the Transvaal legislature in regard to the Chinese coolies as a negative influence, there is the positive deterrent furnished by the strike movement among the white employees on the Rand. As the labor dispute has arisen over the perfectly just demand of the mining companies that highly paid white supervisors should perform a fair amount of work for their big wages, and as, moreover, the authorities have taken prompt measures to prevent terrorism and disturbance, it is probable that the strike will be of short duration, more especially as there are plenty of unemployed men only too ready to replace the strikers; but while the unsettlement lasts, good business

in Kaffirs is, of course, out of the question. At the moment of writing a more cheerful view prevails. It is significant that although some thousands of men are reported to be on strike, no case has yet occurred of a mine having to hang up its stamps from want of labor, and the news just announced by cable from Johannesburg that the engine-drivers' ballot has resulted in a decisive vote against striking is regarded as of good augury for the early termination of the trouble.

Apart from the situation in South Africa, which has no parallel in any other mining centre, it may be of interest to consider whether there may not have been conditions in some of the mines themselves, or in their managements, that have had a deterrent influence of late on would-be speculators and investors. To begin with the section of the Market in which the least disquieting elements have been noticeable, namely, American mining, may it not be said that speculation has died out in the cases of certain mines, mainly in consequence of the monotonous nature of the reports and returns coming from the other side? A steady revenue of 12, 15, or 20% may induce quiet investment on a limited scale, a state of things most proper and desirable from a certain standpoint, no doubt, but to promote speculation, which after all is the life and breath of the mining market—keeping up the interest and ever widening the circle of people that deal in mine shares—more frequent and crisply written reports are necessary, promptly recording the facts, changes, and progress observable, and intelligently noting them for their bearings on the future prospects of the mine. Probably in many cases the amount of knowledge of the mine supposed to be possessed by the officials on the spot is over-rated by the public, but rightly or wrongly speculators here feel they are left to grope in the dark while others more advantageously situated are basking in the full light of day, or in other words, making hay while the sun shines.

In connection with other mining centres, great disappointment and heavy losses have succeeded periods of inflation of prices brought about by exaggerated statements of value, or the prematurely assumed success of some new method or process. On the strength of a big price for the metal, a Cornish tin mining 'boom' was promised, but while a small number of old established mines have done fairly well by being able to sell their outputs at larger figures, most of the operating companies' shares can be bought today at below par value. It is beginning to be recognized that the mines of long standing require much overhauling and renovating of plant and machinery, to say nothing of a more liberal plan of development, before full advantage can be taken of the favorable conditions of the metal market. On the other hand it is found that the old abandoned mines, which were to be reopened with "vertical shafts and levels driven straight to the lode" by the waving of the magic wand of "modern appliances" will require very cautious handling and the employment of much time and money before their 'houses' of long accumulated water cease to be an obstacle to the workers and their 'courses of tin' can be found and profitably worked.

Oroville Dredging has declared a seventh quarterly dividend of 12½ cents per share payable on June 29 to shareholders of record on May 29. The gross yield to May 13 is reported as $1,406,657. Allowing for the estimated yield for the remaining 11 weeks to July 31, the total yardage for the two financial years is brought up to 12,000,000 cu. yd. with a net profit of $800,000, after providing a reserve for depreciation of plant, machinery, &c. Deducting dividends from this at 10% per annum for the period in question, there is an estimated net surplus of $180,000.

Mexico City.

Sale of the Palmilla.—Blaisdell at Pachuca.—Placeres del Oro.—Gardemo Co.—Zapote District.

Bert Peterson has about closed a contract to take the noted Palmilla mine, belonging to Pedro Alvarado, at Santa Barbara. It is said that Mr. Peterson will build a mill and cyanide plant, operate the mine and mill, and assume the indebtedness of Don Pedro for a percentage of the net profits. This mine is estimated to have produced $3,000,000, and still has large quantities of ore available. About $85,000 of ore is now being shipped from the mine. Water is giving much trouble.—— H. W. Blaisdell has purchased a large accumulation of tailing at Pachuca. A metallurgist of Parral carefully measured and tested the pile and found 524,000 metric tons available, carrying 138 gm. silver and 3.1 gm. gold per ton. This is equivalent to about 10 *pesos*, from which an extraction of 75% was obtained. Mr. Blaisdell, therefore, has a good proposition.——The Oxnam Prospecting Co. has ordered stamps to supplement its dry-crushing mill and cyanide plant. Part of the mill is to come from Milwaukee to Temosachic by express, in order to reach Guazapares before the rains commence.—— The new mill of the Veta Colorada Mining & Smelter Co. at Minas Nuevas will consist of 80 stamps, 9 tube-mills (the entire mill product being ground fine) and some filter for washing all the tailing. This is a change from the first plans, which provided for sand and slime treatment, using Blaisdell machinery. It is reported that Grothe's (Pachuca) method of air-agitation for the pulp will be used.

Some recent discoveries of gold and uranium have drawn attention to the Placeres del Oro district, in Guerrero. As the name indicates, there are gold placer deposits in the district, and from time to time they have been examined by experts, and many glowing reports of the immense richness of the field have been published. Two years ago an investigation was made by the Rio del Oro Exploration Co. under a concession from the Mexican Government, and it was found that the average value of the gravel, including overburden, was 15c. per cu. yd., the average depth to bedrock being 2½ metres. There is an abundance of water, but the fall is less than one per cent. In the main river, boulders would interfere with dredging, but there are many flats, covering hundreds of acres, that are free from boulders, and the bedrock being a soft diorite, the conditions are favorable to dredging. This company has been exploiting a number of gold veins, which are showing up well. One ot these, the La Lucha, has a large body of low-grade ore, in which occur shoots that are rich in gold, 200 kilo. having been taken out that averaged over $20,000 per ton. In all some $7,000 have been produced since last September. Some of the ore was shipped to Mexico at an expense of $100 per ton, for freight, and a lot of it was treated in *arrastres*. At present their Elnita mine is being worked; the ore is shipped by burros to the Gardemo Co.'s mill at Milpa Chica, about eight miles distant. Over 50 tons have been milled and 900 gm. of gold have been cleaned up from the plates, besides the concentrate. The ore averages about 38 gm. gold per ton.

The Gardemo Co. has sunk the main shaft of the Piuzan mine to 100 metres and is cross-cutting to the vein, which will be reached in a few weeks. From the 60 m. to the 80-m. level over $100,000 worth of ore was produced in the past two years, and it is expected that the present development will show double that amount.

Salt Lake, Utah.

Shipments From Tintic.—Arresting Fume.—Solution of Smoke Question. — Consolidation at Bingham.—The Cactus Dividend. — Other Dividends.—News From Park City.

Ore shipments from the Tintic district last week amounted to 153 carloads, the contributing mines and respective amounts being: Ajax, 3; Bullion Beck, 3; Beck Tunnel, 8; Bullock, 1; Carisa, 5; Centennial Eureka, 57; Colorado, 6; DePue, 6; Eagle & Blue Bell, 4; Eureka Hill, 9; Grand Central, 6; Gemini, 5; Lower Mammoth, 8; LaClede, 1; May Day, 4; Mammoth, 10; Scranton, 6; Uncle Sam, 4; Victoria, 3; Yankee Con., 4 carloads.

The new bag-house system of the United States Smelting, Refining & Mining Co., installed at the Bingham Junction smelter of that corporation at a cost of $100,000, is in successful operation and the management has expressed the confidence that so far as the United States company is concerned, further serious difficulty over the smoke question is at an end. In explanation of the mechanism of the plant H. A. Prosser, the manager, has given out the following: "It consists of a substancial brick building 192 ft. long, 58 ft. wide, and 60 ft. high. It contains 2,080 bags, each bag being 32 ft. 6 in. long and 18 in. diameter.

The smoke from the lead blast-furnaces is sucked out of the flue by a fan and forced into the bag-house. About 12 ft. above the ground-level there is a steel floor covering the entire space between the walls. In this floor, at regular intervals, about two feet apart, holes are cut 18 in. diam. A pipe, 18 in. diam. and 6 in. long extends upward from each hole. The bags, which are of cotton, are slipped over the end of this pipe and tied with wire. The upper end of the bag is then supported from the roof. The smoke, entering underneath the steel floor, passes up through the numerous openings in the bags and cannot get into the upper part of the bag-house without passing through the cotton fabric, which takes out the solid matter and soot so that the gas leaving the bag-house is as clear as air. The fan pumping the gas into the bag-house is driven by an electric motor, which receives power from a special General Electric 750-h.p. steam-turbine in the power-house. In case this steam-turbine should be shut down for repairs, the power to run the motor can be furnished from another dynamo. It is thus possible to keep the bag-house in operation continuously and there is no chance that a shut-down in the power-house would stop the operation of the bag-house."

The articles of incorporation of the Bingham Central Standard Copper Co. have been prepared and will be filed during the coming week. This company is a result of the coalition of the Bingham Central and Bingham Standard mines at Bingham. The new organization will be capitalized for 1,000,000 shares of $5. Out of this number, 400,000 shares are to go to the shareholders of the Central and an equal number to those of the Standard; the balance, or 200,000 shares, will be left in the treasury for future disposition. Samuel Newhouse is to be president of the organization.

Samuel Newhouse made an inspection of the Cactus copper mine in Beaver county last week and has reported cheerfully; while the directors of the company will meet in New York about July 1, the initial dividend will not be paid until September. The mill is treating an average of 800 tons per day, but as soon as the crushing equipment ordered some time ago is installed, the capacity will be raised to 1,200 tons.—— The old Dyer copper mine in Uintah county has passed into the possession of John C. Gates, of Milwaukee, who is taking steps to operate it again. The mine is equipped with a small smelter and has produced considerable copper in the past. The copper deposit occurs in sandstone and mining was carried on formerly by the quarrying system.

The case of the Grand Central Mining Co. *v.* Mammoth Mining Co., is being tried in the District Court at Nephi this week. These companies have been litigating for several years. The defense lost in two former trials and the judgment of the lower court was affirmed in the Supreme Court of the State. The question now up for settlement is that of determining the amount of damages to which the plaintiff is entitled. The question of apex rights was involved. The Grand Central and Mammoth are two of the principal mines in the Tintic district.

Dividends have been posted for payment on the 20th inst., by the following mining companies at Tintic: Grand Central, $10,000; Colorado, $40,000; Beck Tunnel Consolidated, $40,000; Lower Mammoth, $9,500. The Fish Springs district is represented by the Utah mine, which pays $3,000 monthly.——The management of the New Stockton Mining Co., at Stockton, is taking steps to enlarge the mill on that property. The present plant is treating about 75 tons per day and the capacity of the plant is to be doubled.

Ore extraction has been suspended by the Ontario Mining Co., at Park City. The management has decided to unwater the mine by means of large pumps before resuming the task of re-opening the drainage adit, which has been closed for more than two years. Work in the adit could be undertaken now only at great hazard.

Butte, Montana.

Failure of Butte Exploration Co.— A Dividend.— The Butte & Bacorn.—Original Consolidated.—Report of Butte Coalition.

The failure of the Butte Copper Exploration Co., and the discovery of the stockholders that the company owned nothing except some equipment at the Six O'Clock mine, and a lease and bond on the property, has had a bad effect on some of the other new companies, and some meritorious enterprises will probably find difficulty in raising money with which to continue work. Hereafter, speculators will probably make inquiries as to the assets of the companies offering stock for sale, and many have already started to investigate other companies operating in Butte. There are a number of the new concerns that are selling stock, and have nothing but short leases and options. Other companies own their ground. Among them are the Butte & London, Amazon-Butte, Butte & Bacorn, East Butte, Bullwhacker, Butte Continental, Tuolumne, Butte & Superior, Pilot Butte, while other new companies, like the Butte-Milwaukee, Butte Copper, Butte New York, and Butte Copper Montana own a portion of their properties outright, have interests in others, and options on some. All these companies are making good progress in development work.

The Bullwhacker Copper Co. has declared its first dividend, and will distribute $10,000 on July 1. The company is capitalized for $1,000,000. The dividend is paid out of royalties.

The Butte & Bacorn Co. is now concentrating its work on the Calumet, and is making rapid progress in shaft-sinking. The shaft of the Calumet is about 1,000 ft. deep, and as soon as a sump is completed a station will be cut, and then cross-cuts will be run north and south. Sinking on the Belinda and Colleen Bawn has been suspended. The former is down 810 ft. and the latter 300 ft. The sinking record of the Calumet during four months was 435 ft., 110 ft. of which was sunk in May. The cross-cut north from the shaft will come under the

Belinda shaft, and connection will be made from the cross-cut. Extensive surface improvements are under way on the Calumet. A new 100-h.p. boiler and a larger head-frame are being placed. The company has also ordered a new first-motion hoisting engine capable of working to a depth of 1,500 ft.—— The Alliance Copper Co. is now driving east and west on the vein at 300 ft., and is opening good copper ore. In the west drift nine feet of commercial ore has been exposed, while the east drift has a foot and a half of copper pyrite.—— The Farrell Co., which is working its ground through the Alliance shaft, is still extending a cross-cut on the 200. A small vein of copper ore was cut a week ago, but the vein will not be reached for some time yet.

The Original Consolidated Mining Co., W. A. Clark's only mining company in Butte, has made an annual statement, showing net earnings during the year ending June 1 of $663,259, which is about $15,000 more than the preceding year. The company operates the Original and Stewart mines, both small fractions. The statement gives the following details of operations: Tons of ore extracted, 264,431; gross yield per ton, $9.31; cost of extraction per ton, $4.08; total cost of extraction, $1,080,868; cost of transportation, $57,479; cost of reduction per ton, $2.49; total cost of reduction, $660,244; cost of labor, $731,772; paid for machinery and supplies, $349,096; net proceeds, $663,259.

The first annual report of the Butte Coalition Mining Co., or rather the report covering the 10½ months of its operation in 1906, gives an idea of the future possibilities of the Coalition mines. It also shows some extraordinary accomplishments under the management of Arthur C. Carson, who has had charge of all work since the Coalition Co. took over the Heinze mines. The properties were in a very bad condition when Mr. Carson took charge of them, yet, while carrying through an immense amount of rehabilitation, he mined a total of 336,420 tons of ore during the 10½ months, yielding 75.86 lb. copper, and 2,216 oz. silver per ton, making a total of 24,995,112 lb. fine copper, 730,225.83 oz. silver, and 1,500 oz. gold. Few companies in Butte mine better ore than that, probably the North Butte alone exceeding it in the value of copper, the average being nearly 4%. The company has a three-year contract with the Washoe smelter on a basis more satisfactory and profitable than if it treated its own ore. The mines are operated through a mining company called the Red Metal, all of whose stock is owned by the Coalition Co. The president, T. F. Cole, says: "At the time of the acquisition of the Red Metal Mining Co.'s mines it was deemed advisable to sink its shafts to much greater depth, to drive cross-cuts through undeveloped territory, to extend drifts on ore-bodies found on many of the existing levels, as well as the additional levels to be developed upon completion of shaft sinking; to sink a new shaft on the Tramway claim, with connections on several levels to afford permanent and safe outlet for our men, and provide facilities for the increased tonnage of ores our extra development work would make available; to sink a new shaft to provide ventilation in the Rarus, thereby improving the conditions of that mine for our employees. This company intended to loan to the Red Metal Co. up to $1,000,000 or more if necessary to pay for this extraordinary development work and additional hoisting, pumping, and tramming machinery to properly equip the mines for larger output and economical operation. Owing to the better value received for our metal, and increased values in new ore developed, the loan has not been made, and the Red Metal Co. has accomplished nearly all the work planned and paid dividends of $800,000 out of net earnings, and accumulated a considerable surplus."

Denver, Colorado.

Mining Litigation at Cripple Creek.—Water-power Development.—State Geological Survey.—Measurement of Industrial Temperatures.

The suit of the Portland Gold Mining Co. against the Stratton's Independence Co. and seven of its lessees to recover approximately a half million dollars worth of ore, said to have been extracted from the ground of the Portland company by the lessees mentioned, has so far gone against the Portland company. The presiding justice has dismissed the suit for trespass, on the ground that no trespass has been proved. Pending the institution of a new suit, he has granted an injunction to prevent the lessees of the Independence working in the disputed territory. In all probability the Independence will procure an injunction to prevent the Portland also from working in the disputed ground. It is regrettable that the operation of two such prominent companies should be hampered by this unfortunate litigation, the more so as the past history of both has involved a good deal of similar litigation, which has been at once a source of expense and of annoyance, and a hindrance to actual mining.

The rapidly increasing development of the water-power of the State is one of the most important phases of its development. The largest company operating in this way is the Central Colorado Power Co., which recently attracted attention by the execution of a mortgage for $20,000,000 to the Knickerbocker Trust Co. of New York. The mortgage is secured by the properties of the company, among which are the DeRemer canal and pipe-line, near Glenwood Springs; the Grand River Power & Transmission Co., above Glenwood Springs; the Hine reservoir, on the Williams river, in Grand county; the Hine reservoir No. 2, near Grand lake; the Aspen reservoir No. 1, in Pitkin county; and the New Century reservoir, in Gore cañon. The water-power available at these points is to be developed and transmitted to Leadville, Cripple Creek, Denver, Colorado Springs, and Pueblo. Curtis & Hine of Colorado Springs have been the originators of these various enterprises, and have called to their aid the services of some of the best hydro-electric experts in the United States.

Important work upon the geology of the State is planned by the State Geological Survey. Under the direction of R. D. George, the State Geologist, parties are to study geological problems in Routt, Grand, and Summit, and possibly in Custer and Eagle, counties. The beginning of systematic and organized work is gratifying. No less important is the preparation of a bibliography of all that is known concerning the geology of Colorado, and a compilation of the maps of the State.

The measuring and recording of the temperatures of various industrial operations has, in the last year or two, attained an importance of the first rank. In all operations in which heat is employed there is always some one point at which the purpose of the operation is best served, and the degree of accuracy of securing and maintaining this is a measure of the efficiency and economy of the process. With the demand for apparatus for this purpose has come the supply, so that it is now possible to secure cheap and efficient means for obtaining a continuous record of the temperature employed in any industrial operation. The appreciation of the advantage of this is seen in the almost universal use of pyrometric apparatus in zinc plants, and many smelters are also employing pyrometers to record the temperatures in roasters and blast-furnaces. Not the least gain from their use is in uniformity of operation, for the workman soon learns that neglect to fire up, or to feed the furnace

at the proper time, is unerringly recorded by the instrument in the superintendent's office, with a resulting gain in strict attention to his work.

Johannesburg, Transvaal.

Gold Production.—Labor Troubles.—Contractors' Strike.—Serious Condition of Affairs.—High Wages.—Actual Figures.—Need of Reform.

The gold output of the Transvaal for April has been declared at 537,019 oz., valued at £2,281,110. Of this total, the Rand's contribution was 518,243 oz., valued at £2,201,354. During the past month there were 8,530 stamps at work in the Transvaal, 8,185 being on the Rand. A duty of 8.38 tons per stamp per 24 hours is recorded by the Luipaard's Vlei Estate mine. The lowest stamp-duty is that of the Windsor mine, namely 3.6 tons.

Just now we are in the midst of the most serious strike known in the history of the Rand. There have been small disputes on individual mines in the past, but never such an extensive strike as now exists. For a long time it has been customary to place a white miner in charge of two rock-drills, there being five or six coolies or Kaffirs to do the work. On a few mines, where the conditions are favorable, the management induced some of the men to superintend three machines. There was a lot of grumbling over this at the time, but the men finally agreed to take on the other machine. About a week ago the management at the Knights Deep mine decided to reduce the price paid for contract stoping from 70 to 60 shillings per square fathom, at the same time requesting the contractor to take on a third machine. By the new arrangement the men were required to do a bit more superintending, but they could make the same money. It was high time to do something on this mine, for the wages paid to the underground contractors were absurdly high. A statement has been published, showing that the average pay of men in stopes, during the month, was over £2 per shift of eight hours, while some of the contractors made as much as £1 per shift. The men rebelled at the proposal to run three machines, and as the management was obdurate, the men went on strike. Of course they did not want to see others fill their places, so there was some disturbance. With the help of the police the management got other men into the mines, and although greatly handicapped, the mine was kept going. The men were forced to vacate their rooms on the property, and went elsewhere to spread the trouble.

By the help of the Miners' Union, and a number of labor agitators, the disaffected Knights Deep men have succeeded in working up quite a strike. The cry, "No Three Machines," was carried from mine to mine, and so persistent have the strikers been that today ten of the mines of the Central Rand are officially on strike. On some of these mines three machines have never been suggested, but the men have come out through sympathy, so the strikers say, but the press asserts that it is through intimidation. Some amusement has been caused by the men of the Village Deep mine. A delegation visited this mine, and it was arranged to strike next morning. But the general manager and mine manager made such persuasive speeches next morning that the men went back to work. The strikers were furious and sent another delegation, and once more it was arranged for the Village Deep men to stop work. But again the eloquence of the management prevailed, and the men went back to work. Then a crowd of five or six hundred strikers marched to the Village Deep, and really prohibited the men from going on shift. The last news from this mine is that the miners are determined to continue at work, and are proposing to get up an anti-strike campaign.

Although the strikers have had considerable success, they have had several severe reverses, and it looks as if the bottom were knocked out of the movement. Realizing the desperate position they will be in, should the strike fizzle out, the strikers are making frantic efforts to carry the war further. The campaign on the Central Rand has not proved altogether successful, so the strikers are planning a campaign against the East Rand. A large percentage of the men who have struck will be permanently out of employment, for in many cases their jobs have been filled, and the companies affected would far rather have an inferior man than take back a man who left work without cause. The surest way to get into work again is to stir up trouble on other mines, and when the men have struck to slip into their positions.

Another grievance of the strikers is the fact that they are asked to 'boss' more than 25 or 30 Kaffirs or coolies. The white men consider that 25 is the proper number of unskilled laborers to look after. They are trying to dictate to the mining companies what the number should be.

The men on strike are trying the impossible. Not only are they striving to limit the white man's output (the old trades union idea), but they are demanding the highest pay in the world for this minimum work. That the strike will end disastrously for the men, and that they will curse themselves for this stand later on, there seems no doubt. The strike has thrown such a flood of light on the work done by the underground contractor, and the pay he receives, that it has come as a revelation to the public. On the Knights Deep, where the strike started, the miners have drawn high pay, as shown by the following official statement, which gives the rates paid per man per 8-hour shift during March:

Map of South Africa.

	£	s.	d.
Development—Average	2	9	10
Lowest	1	0	0
Highest	4	1	4
Hand-stoping—Average	1	19	3
Lowest	1	0	0
Highest	3	0	0
Machine-stoping—Average	2	4	10
Lowest	0	18	10
Highest	4	2	11

According to these figures it was about time for the Knights Deep management to do something to bring down the costs. When one remembers that assayers and surveyors receive about £37 10s. per month, that the mine captain gets about £50, it seems highly unjust that the common miners, many of whom cannot write their names, should receive such ridiculously high wages. And this big pay does them no good. It is high time for reform.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

DIRECT contact of platinum with burning charcoal should be avoided, since the silicon reduced from the charcoal ash unites with platinum, making it brittle and liable to fracture.

IN THE concrete foundations of machinery subject to vibration, such as, more particularly, steam-hammers, large gas-engines, turbines, dynamos, and quick-revolution engines, it is necessary to provide a large mass in order to absorb the vibrations.

BESSEMER PIG IRON contains so little phosphorus and sulphur that it can be used by itself for conversion into steel by the original or acid bessemer process. In America this term is restricted to pig iron containing not more than 0.1% of phosphorus.

SUSPENSION BUNKERS, for coal or ore, are made by suspending a steel plate or framework from two side girders, the weight of the filling causing the sides to assume the curve of the equilibrium polygon; the stresses in the plates of a true suspension bunker for a full load are pure tensile stresses.

COPPER may be readily distilled in the electric furnace. When the fumes are condensed on a cold substance, a filiform felting of copper is obtained which has all the properties of ordinary copper. At boiling point, copper dissolves graphite, and releases it in a more or less crystallized form in cooling.

IN 1905 the production of crude barytes in the United States amounted to 48,235 short tons, valued at $148,803 at the mines. This represents the crude barytes after being taken out and hand-cobbed, ready for shipment to the mill. The average price per ton of the 1905 production was $3.08. The producing States were Missouri, Tennessee, Virginia, North Carolina, and Kentucky, given in the order of their rank as producers.

COMMON PRACTICE in collecting the slimes from the zinc-box is to run fresh water through the extractors until the effluent is no longer decidedly alkaline. The zinc shavings in the upper compartment are then rubbed between the fingers to disentangle the slimes, which settle to the bottom of the compartment. The tray is then removed and the liquor and gold slimes are pumped out by a special filter-press or the plug of the compartment is drawn and the gold slimes flow into the launder.

OVER-LIMED CEMENTS are unsound, and, in time, concrete made from them will disintegrate and crumble or crack. Cements which are high in lime without being unsound are very slow setting but harden rapidly, sometimes reaching their maximum strength in as short a period as seven days. Such cements, when subjected to tension tests, usually show retrogression as the test pieces grow older, but, when subjected to compression tests, show an increase of strength with age. High lime cements become very brittle on hardening, hence when they are tested in the ordinary manner more or less distortion is met with, owing to the shortness of the test piece, and the briquette is snapped off, and not pulled apart.

FEW mineral substances are as widely diffused through nature as arsenic. And yet there are comparatively few arsenic-bearing deposit which are so favorably situated as to guarantee their successful commercial development. Some of the more important sources of arsenic are the silver ores mined in Saxony, the tin and pyritic ores found in England, the arsenopyrite or mispickel produced in Spain, and the gold-bearing mispickel and nickel-cobalt-silver ores of Ontario. Native metallic arsenic is found occasionally, especially in association with antimony, ruby silver, and some other ores. Among the countries endowed with good deposits of arsenic are Germany, Great Britain, Austria-Hungary, France, Italy, Spain, Portugal, Norway, Siberia, New Zealand, Chile, Mexico, Canada, and the United States.

AN extraction of about 97% is said to be obtained at the Snowstorm mill at Larson, Idaho, where a copper carbonate ore is being treated. After crushing, the ore is run into agitators, where it is mixed with a 10% solution of sulphuric acid and a solution of chloride of lime. Thus a solution of copper sulphate is formed, while the silver remains as a precipitate of chloride. From these agitators, which are three in number, the copper sulphate solution goes through a series of six settling vats. From the solution, the copper is precipitated with scrap iron, and the residnes containing the silver chloride are treated with sodinm thiosulphate. The solution of silver thiosulphate thus obtained is passed through settling vats and the silver is precipitated from the clear solution by sodium sulphide, the precipitate being filtered and shipped for refinement. The ore runs from 2½ to 3½% copper and about 7 oz. silver.

A PECULIAR occurrence of cobalt and nickel with gold was discovered in 1905 on Rabbit Lake, east of Temagami and about 30 miles south of Cobalt station, in Ontario. The rocks there appear to belong to the Lower Huronian conglomerate-graywacke series. The orebody, about 18 in. wide, was in a zone of fracture. Through the chlorite schist was a reddish felsitic material, which under the microscope was seen to belong to the fragmental series. Veinlets and impregnations of a gray cobalt nickel ore occurred sparingly in both the chloritic and felsitic material. An analysis of some of the more highly mineralized material gave the following results: Arsenic, 22.5%; cobalt, 8.7%; nickel, 6.5%; gold, $8.80 per ton; silver, $1.10 per ton. The Rabbit Lake occurrence is about the same distance south of Cobalt station as those of the township of Ingram are north of it, thus showing that the cobalt-nickel ores are distributed over a distance of at least 60 miles in a north and south direction.

STIBNITE, the sulphide of antimony and the chief source of the metal, is widely distributed in the United States, Europe, and Asia. When pure this ore, Sb_2S_3, also called needle antimony and glance, in the trade, contains 71.2% antimony, and 28.2% sulphur. It is shiny steel gray in color and soft. The oxidized ore, Sb_2O_3, a dense, heavy, white mineral occurring in plenty, is of comparatively lower grade and more complex than stibnite. Senarmontite, or oxide of antimony, usually contains from 30 to 65% of the metal as mined for consumption, but the difficulty experienced in treatment has discouraged the demand. Another common ore is kermesite, or red antimony, a mixture of oxide and sulphide, which is mined principally in Italy. Antimonial ochers, found largely in Algeria, Asia Minor, and Borneo, are of some value as a source of the metal. Antimonial lead, produced in quantity by leading refining works, is an important contributor to the supply of antimony.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Meaning of Striations.

The Editor:

Sir—In your issue of April 6, a letter by Mr. Horace W. Bucke describing a few geological conditions calls for some amplification of his discussion. Recognition of the fundamental position of geology to mining is rapidly spreading, and it devolves upon the mining geologist to do his best to keep clear the true relations of the science to the art.

Every ore formation owes its genesis to two sets of conditions, physical and chemical. Of the physical conditions the most essential, in the sense of being necessary first to be present, are the structural features in the rocks. At any place one set of conditions may be right for the deposition of ore, yet no ore will be present because some or all of the other conditions are lacking. In many mines are found fault-fissures with considerable open space, yet not containing an ounce of ore. Striations are of themselves nothing more than simple records of rock movement, or faulting; they come under the category of physical conditions. It is only when possible watercourses along fault-planes are seized upon by chemical waters from above or below that striations become of value in deciphering the character of ore-shoots. And here we come sharply against a fact that does not receive sufficient emphasis. There is no necessary simple relation between the situations on the walls of a fault, or vein filling a fault-fissure, and the relative position of the walls. The actual position of the walls is due to a number — seldom one — of separate movements. Often the striations are curved. The vital point is that the striations mark merely the direction of the last motion at the particular place where found. In a certain mine in the Inyo range, where the faulting is extremely complex, a strong north-south fault was characterized by great horizontal movement at first, followed later by vertical motion. Both sets of striations are preserved. Ore deposits along the fault were later than the first slipping, and earlier than the last. A third set of movements was vertical, with resultant striations on the ore. Thus in many orebodies faulting has occurred before, during, and after the deposition of minerals, rendering the study of the conditions difficult. Hence it may be stated here (for a full discussion is out of place), that the striations on the walls of mineral veins are but one of *many* conditions to be used in determining the position of orebodies. There are many cases in which simple relations obtain between the striations and ore-shoots, but it is productive only of error to generalize from the simplest facts alone.

Regarding 'laws' of enrichment of orebodies, it is necessary to remark that as yet the laws of mineral deposits can be only of the most general character. A fast-growing science like economic geology is busy gathering new facts; it is not arranging, except tentatively, known facts into laws.

The few facts cited by Mr. Bucke are altogether inadequate for the basis of an opinion on possible or probable orebodies, though probably a determination of all the facts would furnish sufficient ground for exact statements. From what was given in the letter about calcite, it would seem that this mineral is the result of a later period of circulating mineral waters, which possibly have caused (by secondary concentration) the irregular value of the vein. The vein is cut by a diorite dike and it is this intrusive that has probably set in motion the calcareous waters. Calcite veins accompanying dioritic intrusions are not uncommon, but of itself the calcite in this part of the world is usually lean. The gold veins of the Mother Lode are characterized by carbonates, but ores most heavily charged with calcite, dolomite, and ankerite, are lowest in value. In one mine near Angels Camp, calcite veins have been enriched by silicious solutions carrying gold. The pure carbonate carries little value, and rich rock occurs only where quartz is present. In the Empire mine at Grass Valley, the vein on the 2,000-ft. level, typical of the area, shows 3 to 4 ft. of rich quartz on the foot-wall, and about 4 ft. of wall-rock thoroughly impregnated with calcite on the hanging. The quartz carries only traces of gold. However, there is no reason, given the necessary physical conditions, why calcareous waters cannot act to cause secondary enrichment of pre-existing veins. For instance, such action is progressing on the Comstock, where the big bonanzas themselves were probably due to secondary enrichment by solution and re-deposition. Again the facts stated by Mr. Bucke are far too few. Too much must not be asked of geology.

JOHN A. REID.

Stockton, Cal., June 1.

The Mine Boarding House.

The Editor:

Sir—Mr. Alderson, in one of his valuable 'Letters of a Self-Made Miner to his New Foreman,' touches upon a subject that seems to me worthy of more extended consideration than he gives to it, namely the feeding of men employed in a mine. In mining camps where there are various boarding-houses not connected with the mines, the matter takes care of itself, and it is generally true that such boarding-houses furnish excellent food because the miners receive good pay and will refuse poor food. It happens frequently however, that the mine is isolated and the company is obliged to maintain a 'company boarding-house,' which is usually a source of constant annoyance to the superintendent, and too often is unpopular with the men. Years of experience in charge of mines where boarding-houses have been necessary, have confirmed me in the belief that under such circumstances the only satisfactory plan is to consider the boarding-house a mutual affair. The company furnishes the boarding-house in order to carry on its work; the men pay for their board simply to get food; neither should attempt nor expect to make any profit at the expense of the other. A boarding-house properly conducted should charge sufficient to allow for a well-furnished table without loss, and no more. The rate charged belongs to the table and the men, and not to the mine.

Mr. Alderson writes to his foreman: "Your men must be well fed." This is quite true, and he might have added that without feeding them well it is impossible to keep good men; they don't have to stay. As a business policy the reputation of a good boarding-house is worth more than it costs simply by attracting good men; it attracts worthless men too, but these can be weeded out and a good crew secured and held. Any man who gets up from a table well satisfied with his meal is easily worth twice as much in a mine, between meals, as the man who leaves the table dissatisfied and angry because he feels that the company is trying to make a profit from his food. Buying low-grade food for the boarding-house table is the exact reverse of the very good policy of buying high-grade oil to save friction in machinery. At the end of the year a company's books may show a few hundred dollars profit from the boarding-house, but if

the real truth were known it would disclose a much larger resulting loss in the mine.

F. N. FLETCHER.

Greenwater, Cal., May 29.

The Rand Labor Strikes.

The Editor:

Sir—From the recent cabled information from the Rand, it is evident that the true issues as between the employer and the employee in these Rand labor strikes, are not only in danger of being obscured, but are also very little understood at all on this side of the water. Quite recently I visited many of the most important of the gold mines at Johannesburg, and in going through the underground workings, I made it my special object to draw out from the miners themselves, the mine managers, and all others interested in the question, all their various views on the main question upon which these strikes are based, that is, the employment of more than two machine-drills by each miner.

I must first explain that the miner on the Rand occupies a distinctly different position to miners in any other part of the world, for the simple reason that he, more properly speaking, is himself an employer of labor, as a petty contractor. In this position he contracts with the company for it to provide him with one, two, or more machine-drills and the power, in the form of compressed air, to operate these drills.

In order to assist him in the strenuous work of setting up these heavy drills in such a position as to do their work most effectively, which is to break down the maximum amount of rock when these holes are finally blasted with dynamite, this miner-contractor employs three or four Kaffirs or Chinese coolies to assist him. After the drill has been fairly started, the actual working of it can easily be entrusted to the more intelligent of these Kaffir and Chinese assistants, and the miner himself can then retire into some convenient place, where he can rest, smoke his pipe, eat his lunch, and listen to the steady tap tap of the drill. Should any breakdown occur, or the drill get jammed, the miner, hearing the tapping noise cease, goes down to ascertain the cause, which is usually righted by the use of a spanner and the aid of a little hard language, mainly a mixture of Cornish, Kaffir, and Dutch swear words.

An intelligent contractor, with two machine-drills, can easily make £50 or even £100 per month, his cost of living, as a bachelor, being covered by £12 per month, or as a married man, £25 to £30. It is evident that he is making far larger profit on his labor, than not only any other of the miners who may be on day's pay at the rate of 15 or 20 shillings, but also any of the other skilled laborers, such as engine-men or mechanics. There is no dispute, and there certainly is no reason for any dispute, between the employers and any other portion of the skilled laborers, all of whom are getting reasonably paid, and are doing far better than similar men in other parts of the world, as the cost of living has, during recent years, been materially reduced, and the companies house their men for merely nominal rentals; so that in these respects, those employed in the mines are in a far better position than the poor residents of Johannesburg, who, as a rule, depend for their livelihood largely upon share-market operations, which, of late, have been practically nonexistent, or on the losing side. It will be noted that these contractor-miners are insisting that great damage is done to their health owing to the fine dust made by the machine-drills.

This argument is, to some extent, correct, when applied to the miners who are on development work. Miners, working under these conditions, certainly suffer from dust and deserve to be considered in quite a different category to the far larger majority of men, who are breaking down the rock in stopes, for, under these conditions, not only can the miner easily work two drills, but sometimes three, and occasionally even four machine-drills. As only a limited number of competent miners are permitted by the Union to do this contract work, it is easily understood why they object to look after more than two drills, as there would not be sufficient work to go around for them all; the work is therefore practically kept in a closed ring and those who learn machine-drill work and might easily make as 'big money,' are not allowed by the Union to come within the charmed circle. No better time for such a strike could possibly be chosen for the employer of labor on the Rand, and no worse for this ring of union miners, as, on one side, the employers say that very shortly they must shut down their mines altogether, with the exception of the rich dividend-payers, that is, if the Chinese coolies are removed before an intelligent substitute has been found for them, and on the other hand, in a few short months, a large number of those now unemployed, among the English and Dutch, could be taught sufficiently how to operate machine-drills as to permit of their taking the place of these petty contractors, who now so foolishly stick out for totally unreasonable terms of payment.

Judged from a share-market standpoint, for my own part, I would take these Rand labor strikes as a bull rather than as a bear point, as most certainly they will finally result in favor of the employer and reduced costs of working, and consequently larger profits to shareholders in mines that in most cases are paying little or nothing at the present time.

EDGAR P. RATHBONE.

London, May 24.

SALT IN MEXICO.—The manner of extracting the salt from the many shallow lagoons along the coast in the vicinity of Manzanillo is primitive and simple. At a convenient place, generally at high-water mark, the following is constructed: On top of four strong posts, placed upright and protruding out of the ground about six feet, a flat covering is built of poles; on top of these about a three-foot thickness of dry grass or straw is placed. When completed it is a flat-roofed shed, with straw covering. This is to serve as the filter. Underneath this a receiving bowl is made of stone and lime mortar. At one side of the filter and bowl the evaporating pans are made of lime mortar, being shallow tanks not over six inches deep and divided into squares of about 150 superficial feet each. This completes the salt works. A layer of earth one-fourth to one-half inch thick is then scraped daily from the exposed land that was covered with water when the lagoon was full in the wet season. This earth is carried in baskets on men's heads to the top of the filter and emptied onto the straw roof. Water is then filtered through the earth and straw, and falls into the receiving bowl highly charged with salt. The liquid is passed to the evaporating pans, this being done with earthen jars. The sun evaporates the water and leaves the pure salt, which is piled up in the sun to dry. It is then packed in bags and conveyed by mules to the market. The cost of making this salt is about $3.50 per ton, and it sells for at least twice that much, even when the prices are lowest. It is considered the best of the Republic, and commands the highest price. About 15,000 tons are now produced each year during the three months' season. With machinery much more could be made, and no doubt at much less cost. There is a ready market for many times the quantity now produced.

The Filtration of Slime by the Butters Method.

Written for the MINING AND SCIENTIFIC PRESS
By E. M. HAMILTON.

As the Butters patent filter has now been in operation for nearly three years, it may fairly be considered a practical success, and the aim of the present paper is to give a detailed description of its inception, construction, and method of working, in the hope that it may prove of general interest to the mining community.

The need of a filter of some sort was first forcibly presented to the minds of Charles Butters and his associates at their works in Virginia City, Nevada. The tailing being cyanided there was originally derived from the Comstock mills, but it has been treated and re-treated several times by the pan-amalgamation process, and as it stands today in the dams it contains about 75% of material that is unleachable, and which may therefore be designated as 'slime.' And this slime is of an exceptional character. In addition to difficulties connected with solution of the gold and silver contents, which it is not proposed to touch upon in this paper, the mechanical condition of it is such that it gives trouble in settlement for decantation. The clarification produced by a coagulent such as lime is perfect, but the subsidence is so slow that the amount of solution recoverable in this way is not enough to make the decantation process a practical success. A 70-ton charge, with a 4 to 1 dilution, will in 24 hours not settle to less than 3 parts by weight of solution to 1 of slime, and the thickest pulp obtainable by two or three days' settlement in the deep vats will still contain about 2 of solution to 1 of slime.

A curious point about it is that even after being washed in many changes of clean water to remove all soluble salts, it will still settle in a medium of distilled water more rapidly and compactly than in any solution hitherto tried, whether acid or alkaline. When lime, however, is added to the pulp the mixture seems to coagulate into a gelatinous curd, and the slime loses to a large extent its power to separate out by gravity.

Here are displayed in a marked manner the phenomena mentioned by Julian and Smart in 'Cyaniding Gold and Silver Ores,' namely, that coagulation is not necessarily accompanied by good settlement, and that under certain circumstances excessive coagulation is positively injurious. In one instance a sample of slime, from which most of the fine silica had been removed by careful separation, was diluted in the proportion of 4 of water to 1 of slime, and sufficient lime added to neutralize the charge and leave about 0.05% of free alkali in solution; this pulp was then placed in a graduated litre cylinder, where its level stood at the 875-c.c. mark. At the end of 24 hours the solids had not subsided through more than four divisions of the scale, a distance equivalent to 40 c.c. of solution.

Another fact pointed out by the same authors, in regard to the quality of the settled slime produced by different electrolytes, is also exemplified on this material, for the use of caustic potash instead of lime produces a curd of much finer grain, which settles better in every way, and finally yields a good clarification also, though the latter proceeds more slowly than the subsidence of the well-marked line of solids, and the solution has not the brilliancy of that settled with lime. Thus, if the filter method had not been adopted it is probable that caustic soda or potash would have been more useful than lime as a protective alkali.

In regard to the settlement in distilled water, if it be true that some degree of coagulation is a necessary precursor to settlement and clarification, then the slime being treated must either possess some inherent power to coagulate, or else, in spite of thorough washing, must develop sufficient soluble material by standing in water to form an electrolyte suitable for this purpose.

It may be interesting here to give a few results, out of a number of determinations, on the rate of settlement of this slime. These tests were made on an average sample such as is usually treated in the vats. The accompanying diagram will illustrate. (See Fig. 1.) The arrow-heads denote the defined surface lines of subsiding solids; the

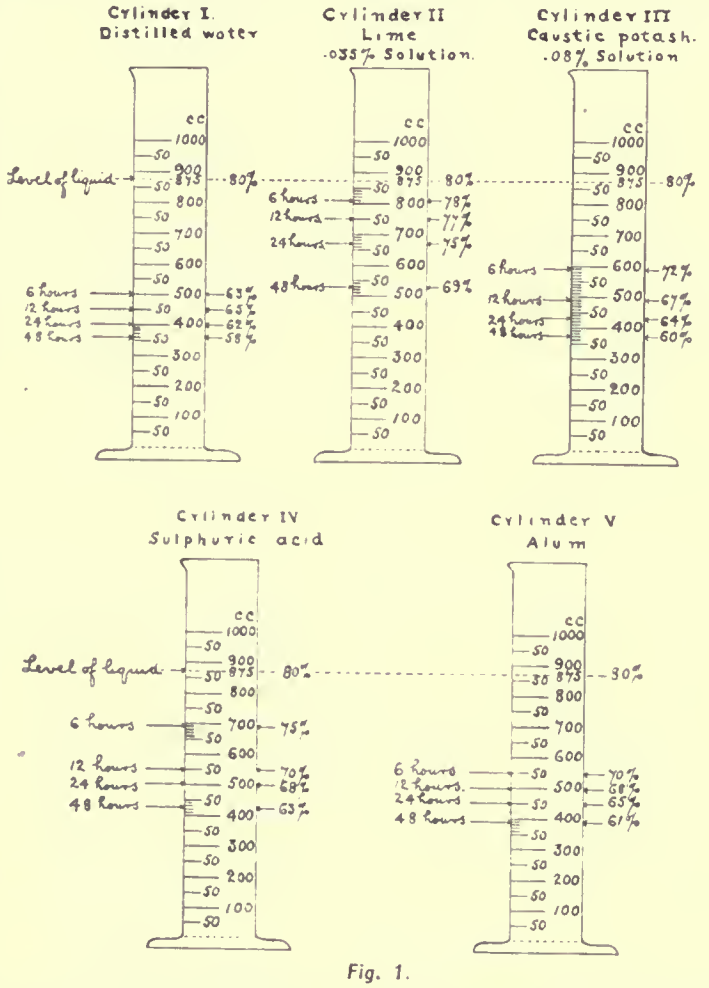


Fig. 1.

percentage figures on the right-hand side of each cylinder represent the percentage of moisture still held by the settled slime at that point. The following notes will explain:

CYLINDER No. 1.—This sample of slime was washed in 10 changes of clear service-water, the operation extending over several days, and finishing with distilled water. When this last wash had been settled and decanted, distilled water was used to bring up the dilution to 4 to 1. The line of subsidence was well defined from the start, but the liquor retained a faint opal tint, which did not disappear throughout the test.

CYLINDERS No. 2 and 3.—These were both neutralized with their respective alkalis for two days before beginning the test, so as to insure having an approximately constant strength of free alkali in solution during the time of settlement; in the case of the lime this strength was 0.035% alkalinity, and in that of the caustic potash 0.08%, both in terms of caustic potash.

Similar tests, made with considerably larger amounts

of free alkali in solution, showed slightly inferior results in the case of lime, but a tendency to closer settlement with caustic potash. In the case of cylinder No. 2, the lime left a sparkle and limpidity of the supernatant solution lacking in that settled with caustic potash, though the latter might be said to be perfectly clear unless compared with No. 2, when a difference would become apparent.

CYLINDER NO. 4.—In this test the same amount of slime was taken as before, and the same proportion of water added. Sufficient pure sulphuric acid was then mixed with it to leave a little free acid in excess after dissolving all it would of soluble material. In this medium the slime settled better than in the lime solution, but the liquid remained slightly opalescent.

CYLINDER NO. 5.—To this 5 grams of alum were added and allowed to dissolve, giving a result nearly as good as that obtained with caustic potash, and a solution of about the same degree of clearness, that is, clean, but lacking the absolute purity of the lime solution.

The experiments here given will be sufficient to indicate the nature of the material to be treated, which has a bearing on the results obtained by the use of the filter.

After experimenting with several forms of vacuum-filter units, both cylindrical and rectangular, the system hereinafter described was finally evolved, and very few changes have been made in it since the first appliance was installed on a working scale in the Virginia City plant.

As at present constructed the filter-leaf is made on a frame, the upper side of which is formed on a bar of wood, 1¾ in. thick and 5½ in. wide, placed on edge, and 10 ft. in length, or sufficiently long for its ends to rest on top of the containing-box from side to side. (See Fig. 2.) The remaining three sides of the frame are made of ½-in. pipe, one extremity of which is flattened, turned at a right angle, and firmly bolted to the under side of the wooden bar, while the other extremity projects through the other end of the same bar, in order to receive its connection with the vacuum-chamber, being tightly clamped to the wood at the point where it passes through. The upper face of that portion of the pipe forming the bottom of the frame is pierced with 5/16-in. holes at intervals of four inches for its whole length, and through these the solution passes off from the filter into the receiver.

The filtering medium consists, first, of a piece of cocoa mat, of such a size as exactly to fill the space formed by the frame described above. On either side of this is placed a sheet of 16-oz. canvas, large enough to overlap the frame. These three thicknesses of material are then sewed together by machine with parallel rows of stitching four inches apart,* and perpendicular to the sustaining wooden bar. Next, the filtering medium so formed is fitted in the frame, the overlapping canvas edges being stitched round the outside of the piping, and the upper edge fastened to the wooden bar by being sunk in the groove shown in the drawing and a lath driven in over it, wedging it firmly in position. This lath is also made to fulfill another function; instead of being of such a thickness as to be driven flush with the surface of the wood, it is made to project outward for a distance of about half an inch, and the under side of this projection is grooved or weathered so as to deflect the drippings of solution that run down off the bar when the pulp is withdrawn, and prevent them from trickling over the surface of the newly-formed cake. This action was found to cut channels in the surface of the slime, and form the starting points of cracks. A point to be noticed in the section (of the head of the frame) is the shoulder, formed by the lower angle of the wooden top, over which the canvas has to be strained before reaching its attachment. The lack of support at this point between the canvas and the cocoa mat was found to cause a tendency to start cracks in the cake, and to avoid this the material is rendered impervious with P. & B. paint down to the line at which it comes in contact with the mat, which is about 1½ in. below the lower extremity of the wooden support. At this point there is a horizontal line of stitching holding the three thicknesses of material together. The paint is also applied all round the frame of pipe in a border about an inch wide, for the same reason, and this has proved a simple way of meeting the difficulty and giving the cake a perfectly plane surface on which to build itself up.

After everything has been done, six or seven strips of wood are placed vertically on each side of the leaf, thus dividing it into a number of panels of equal size; these reach from top to bottom of the frame and are screwed together through the filtering material. They act as braces to stiffen the frame and also to hold the canvas vertical and prevent it from sagging out to one side or the other.

For localities where water is scarce, and generally where it is desirable to send out a comparatively dry cake, the frame of the leaf is now modified to admit of throwing off the cake without previously submerging it in water as is done at Virginia City. The frame of pipe in this case is made to extend round all four sides instead of only three; the extremities pass through the wooden bar at each end instead of only at one end of it, and the pipe at the upper side of the frame is perforated like the lower one. By this arrangement, water can be injected into the leaf along the top through one of the projecting extensions of the pipe, and simultaneously compressed air can be admitted through the other pipe into the lower part of the frame. This has been found to make a perfect discharge of the cake into the empty box, whereas water alone could not be made to give a proper discharge unless the cakes were submerged.

Compressed air, alone, can be used for a dry discharge, but it is not as satisfactory as the combination of water and air simultaneously. (See Fig. 3.)

At Virginia City the containing box is an electrolytic precipitation box which was not needed for its special purpose and was adapted to the use of the new filter, being allowed to remain in its original position. It was formerly divided into 12 compartments, each having a hopper-bottom; the partitions were removed, and with them two of the sides of each hopper, so that the whole space was vacant from end to end, and after the heavy top rails had been removed the result was a box 31 ft. 8 in. long and 9 ft. 11 in. wide, the sides being vertica for a depth of 5 ft. and then meeting the V-shaped bottom.

In place of the top rails, boards 5¾ in. wide and 1 in. thick were placed horizontally on the top edges of the box, and on the outer edge of these were fixed vertical boards 12 in. high and 1¾ in. thick, all being well bolted together and to the box, the result was to raise the sides 10 in. higher than they were when used for precipitation. The two shelves thus formed along the sides of the box serve to carry the ends of the filter-leaf bars and allow the leaves to hang free inside the box. (Fig. 4.) On one side of the sloping bottom and extending down to its lowest point are four discharge-doors, each giving an aperture of 12 in. square; the doors are hinged on their lower sides, and seat on a rubber insertion led into the iron frame; they are closed by hand, and then held in position by a lever. To discharge the contents of the box it is only necessary to shift the lever, and the door drops open by its own weight. At each end of the box

*The latest plan is to have these rows of stitching only one inch apart; this gives greater strength and rigidity.

is another door 10 in. square, through which the nozzle of a hose is manipulated for flushing out any hard slime that may remain behind in the bottom.

When designing a containing-box for the special purpose of the filter, the lines of the original box are departed from as regards the shape of the bottom, which is

by the Rix Compressed Air & Drill Co. of San Francisco, and is described in their catalogue as a "vertical duplex blowing engine." It has two cylinders 14 in. by 8 in. and is belt-driven, the crank-shaft making 120 rev. per min. Only one cylinder is used for the purpose of the filter, the other being connected with a separate drum

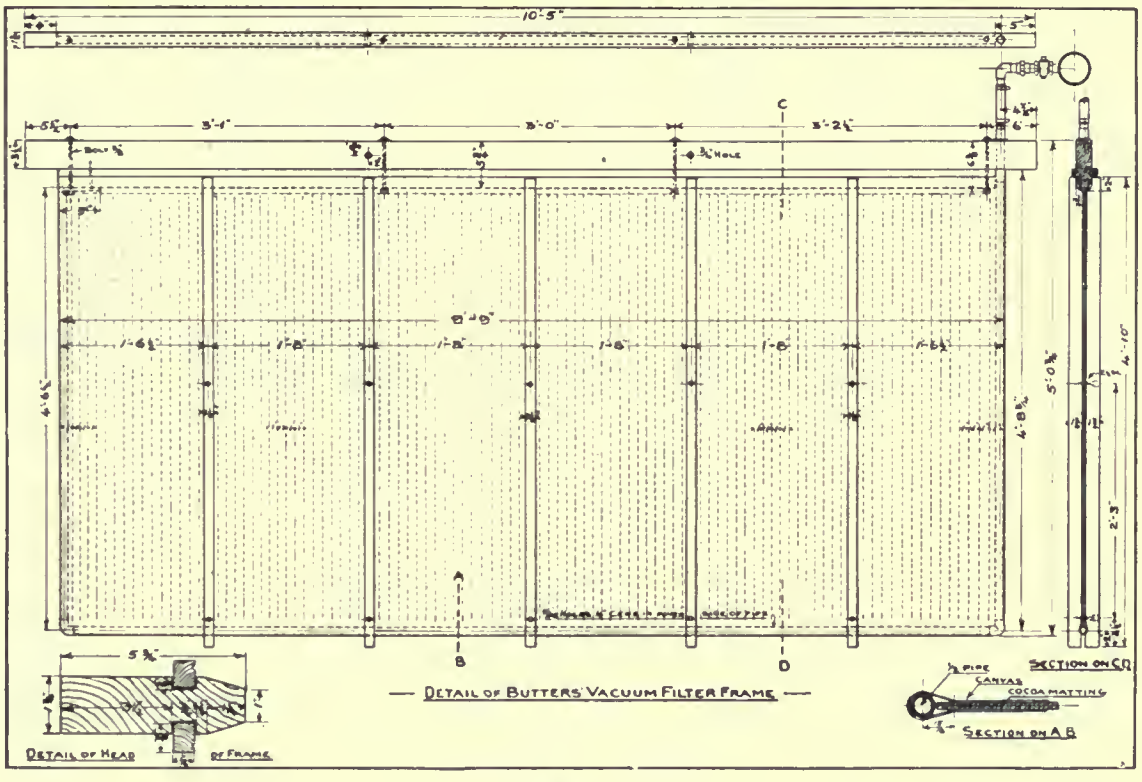


Fig. 2.

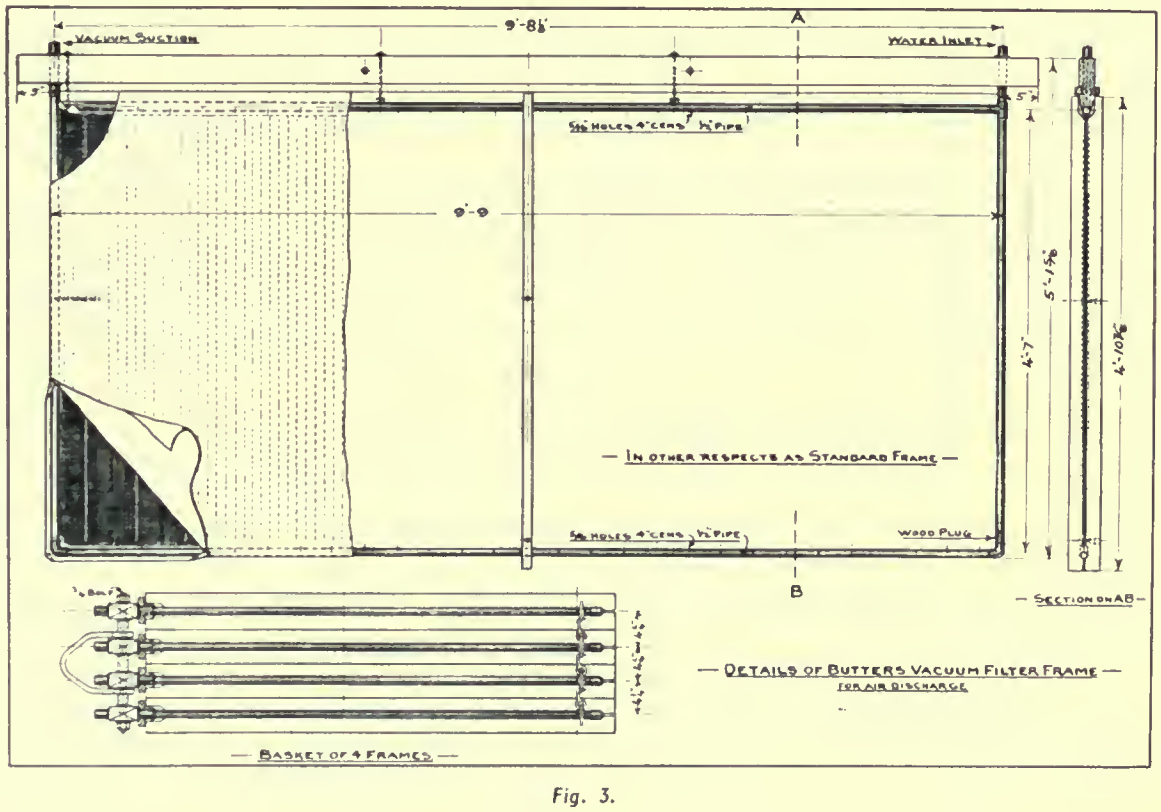


Fig. 3.

then composed of one or more complete hoppers of about 60° for the better discharging of the cake, and the door of each hopper is placed at its apex and may be a 12-in. quick-opening valve or any other suitable device. With such an arrangement the residue gravitates out without the aid of any washing with hoses.

At Virginia City the exhaust-pump is a converted compressor, which happened to be on hand. It was made

and used to form a vacuum for drying out the final washes from the sand-leaching vats.

The vacuum-drum is of riveted boiler-plate, and is 3 ft. 8 in. diameter and 13 ft. 4 in. long, standing upright on its end. The pipe from the vacuum-pump enters at the top, while the pipe connecting with the filters enters 1 ft. from the bottom. At or near the bottom a drain-pipe enters, for removing the

solution as it is drawn in from the filter-leaves. This pipe passes down into a small sump 22 ft. below, so that the solution will drain by gravity and keep the chamber empty. The level of the solution in the sump is, of course, always kept above the discharge to prevent the entrance of air into the drum. The average barometric pressure at the level of the works is 21.5 and the average vacuum maintained is 22.5 in., which is indicated by a column of mercury connected with the drum. As the small receiving-sump fills with solution, it is periodically pumped into a storage-vat, from which it passes to the precipitation-boxes.

Instead of the dry vacuum-pump and gravity-drainage, a 'wet' vacuum-pump may be used, which would obviate the necessity for placing a solution-sump 20 to 30 ft. below the filter-level, in cases where such an arrangement might be difficult or undesirable.

The filter-leaves are placed in the containing-box at a distance from each other of about four inches from centre to centre, and are then ready to be connected with the vacuum-drum. One space is usually left vacant midway along the box to allow access to the surface of the leaf for purposes of measuring the formation of the cake, and also of admitting an electric light to observe its condition after the charge of pulp has been withdrawn. Blocks of wood are fastened on the shelves that carry the filter-leaf bars to act as spacers between the leaves, and it is generally found advisable also to use a line of blocks or

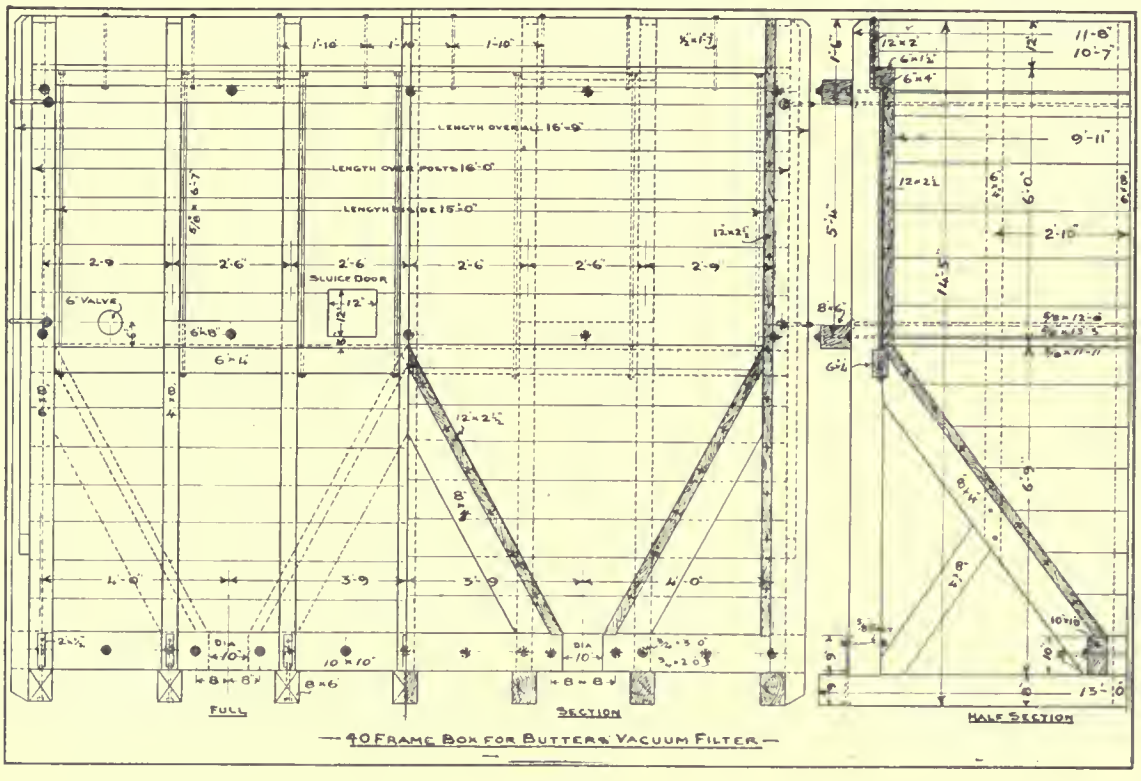


Fig. 4.

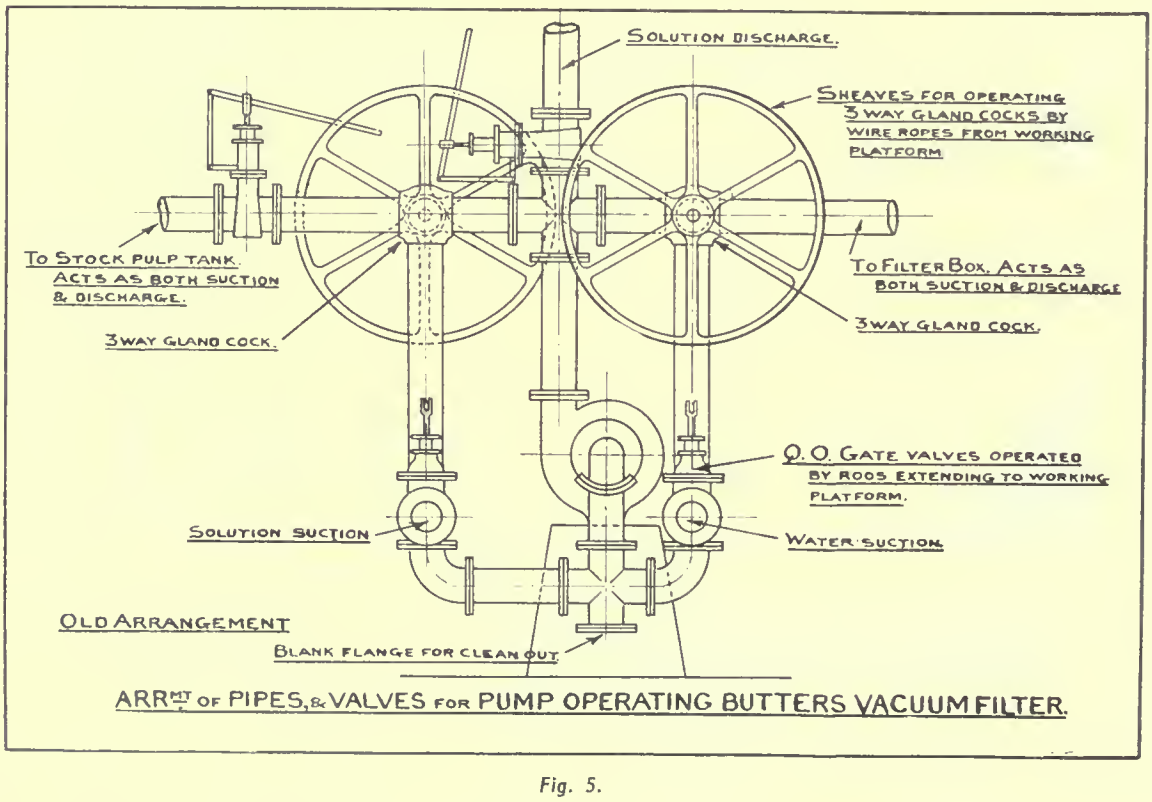

SOLUTION DISCHARGE.
SHEAVES FOR OPERATING 3 WAY GLAND COCKS BY WIRE ROPES FROM WORKING PLATFORM
TO STOCK PULP TANK. ACTS AS BOTH SUCTION & DISCHARGE.
TO FILTER BOX. ACTS AS BOTH SUCTION & DISCHARGE
3 WAY GLAND COCK.
3 WAY GLAND COCK.
O. O. GATE VALVES OPERATED BY ROOS EXTENDING TO WORKING PLATFORM.
SOLUTION SUCTION
WATER SUCTION.
OLD ARRANGEMENT
BLANK FLANGE FOR CLEAN OUT
ARRMT OF PIPES, & VALVES FOR PUMP OPERATING BUTTERS VACUUM FILTER.

Fig. 5.

iron clamps down the centre of the row of frames to prevent the bars from sagging horizontally toward one another under the weight of the cake. The ends of the bars, too, need to be held down in their places by wooden buttons, to prevent them from floating up by the action of the buoyancy of the thick pulp.

A 4-in. pipe runs the whole length of one side of the containing-box, and has a number of small horizontal holes bored in it, one exactly over each filter-leaf; into each hole is screwed a ½-in. nipple and plug-cock, on the further side of which is a union into which screws the small end of a reducing ell; the large end of the small ell enters a short length of rubber hose, which connects with the projecting end of pipe from the filter-frame (Fig. 2). Thus, by unscrewing the union any individual leaf may be disconnected and removed from the box in a few minutes.

At each end of the 4-in. pipe is a quick-opening valve; one is connected with the vacuum-drum, and by opening it the suction is applied to the filters. The other unites with a low-pressure water service of about 20 ft. head, and through it water is admitted between the two sheets of canvas for the purpose of detaching the residue-cake prior to discharging.

There is also a ¾-in. pipe running all round the top of the box; this has holes pierced in its under side, and is connected with a small solution-vat above; its function is to form a spray to wash down the sides of the box when the pulp is withdrawn, so as to reduce to a minimum the amount of slime introduced into the solution-vat when the subsequent wash is thrown back, and also to minimize the loss of valuable solution in cases where, as at Virginia City, a water-wash follows directly on the withdrawal of the surplus pulp and is discharged with the residue-cakes.

The charge of slime, after being treated by agitation in the ordinary way, but not having received any subsequent washes, is allowed to settle for 24 hours in the treatment-vat. When the clear solution has been decanted, the charge is stirred up and run into a deep settlement-vat, of which there are three in use at the present time. Here it settles, usually for two or three days, and from here, after being decanted as closely as possible, it is taken directly into the filter.

This method of feeding the filter works well with the peculiar slime under discussion, but for the more ordinary kinds of slime and particularly when there is much fine silica present, it is found advisable to have the stock pulp-vat fitted with a mechanical stirring-gear to keep the slime from settling too hard for pumping and to give a homogeneous product to the filter.

All transfers in connection with the filtering process is performed by a single 6-in. centrifugal pump (see Fig. 5) with valves and levers so arranged that the man in charge can carry out each operation without moving from one spot. From an examination of the pipe-connections with this pump it will be seen that it will first draw pulp from the feed-vat and throw up through the bottom of the filter-box; next, it will draw from the filter and throw back through the bottom of the feed-vat; it will then draw from either the solution-vat or water-tank to fill the filter-box and return the same to where it came from.

This may look complicated on paper, but it is perfectly simple for the operator, and a new hand will learn the whole routine in a couple of days. Within easy reach are, first, the clutch-lever for starting and stopping the 6-in. pump, and another for the 4-in. centrifugal used for emptying the drain solution sump; second, two small winches connected with wire-cord with the two 3-way valves, each having a dial indicator visible from his station to show exactly the position of the valve; third, four iron handles projecting through the floor at his feet, for opening and closing the straight-way valves of the system: these also are marked, so that there may be no mistake. Within three feet of where he stands the filter-box is situated, and close alongside is the vacuum-drum with its mercury-gauge, and gate for opening and closing the main vacuum-pipe; and 30 ft. away, on the same level, is the valve that admits water to the leaves for detaching the cake. Thus, the only occasions on which he need move more than a few feet from his station are, (1) when he has to go below to manipulate the discharge-doors of the box, (2) when he has to change from one feed-vat to the next one, and (3) when it is necessary to oil or pack one of the pumps.

[TO BE CONTINUED.]

HOW AN INFANT SALTED VANCOUVER.—In the early part of the present month no little excitement was caused by a most interesting story circulated by the daily press of Vancouver, and at once telegraphed broadcast throughout the land, to the effect that alluvial gold in paying quantities had been discovered in the east end of the Terminal City. The details were comprehensive, names of the fortunate finders were given, and public expectation of a new Klondike on Burrard Inlet was raised to fever heat. Developments were anxiously looked for. They came. We will let our contemporary, the Vancover *Province*, tell the sad story in its own inimitable way:

"W. J. Haddock, partner in the firm of Parsons, Haddock & Co., produce and commission merchants, is part owner of a mischievous nephew. Three years ago Mr. Haddock came down from the Cariboo district, after spending several seasons in that country. He took rooms with relatives who live at the corner of Keefer street and Dunlevy avenue. Among the treasures which Mr. Haddock brought from Cariboo was a little sack of nuggets worth a hundred dollars. One day Mr. Haddock's nephew, aged about 5, was left alone in the house. He selected as his particular plaything this little sack of nuggets. When his elders arrived home, the hopeful was found playing in the ditch at the corner of the streets mentioned. In his hand was the sack, but the nuggets? What became of those nuggets? Last week the entire east end of Vancouver was agitated by the story of the finding of a number of nuggets in this identical spot. Painful though it may be, the truth must be told.

"It's a sad life we live, all right, all right. Especially when we have to knock the town."—*B. C. Mining Exchange.*

QUEENSLAND is not only the home of the opal, but authorities declare that the State contains a greater variety of gem stones than any other country in the world. Unfortunately, however, because of natural obstacles difficult to surmount, the opal industry has not developed as rapidly as the excellence of the gem should warrant, but in spite of trying climatic conditions and other handicaps which confront the miner in the quest for these stones, it is estimated that opals valued at fully $1,000,000 have been found in the Queensland field and distributed all over the world. The opal is found in matrices of ironstone, sandstone, and occasionally in pipe clay, and is roughly classed as boulder opal, sandstone opal, and pipe opal. The commercial value of the uncut gems depends so entirely on their quality that it is difficult to quote prices without giving a detailed description of a particular gem and affixing thereto its value in the fields. The same difficulty obtains with regard to opals after they leave the lapidary's hand.

The Great Silver and Lead Mines.

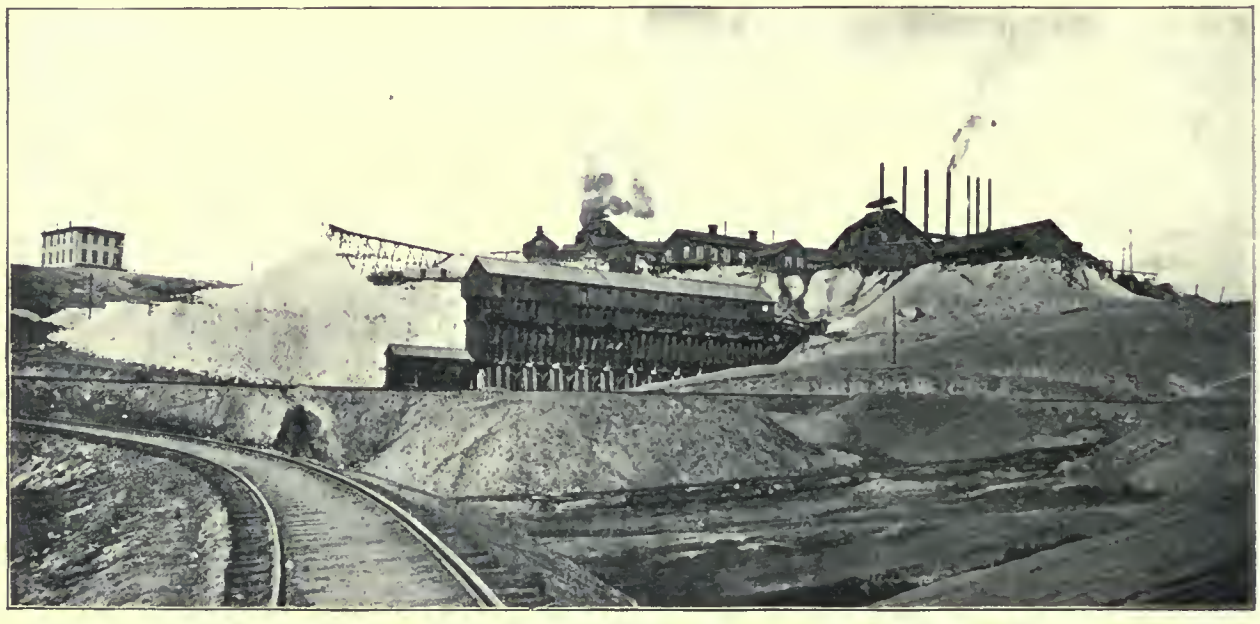
Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

To children their elders look like Olympians and to most of those engaged in mining the famous bonanzas seem potentialities of wealth beyond the dreams of avarice. They are interesting as being the biggest of their kind. In a recent issue I gave a list of the great gold mines, and on this occasion I shall refer to those that produce silver and lead. This is less difficult than the enumeration of the principal gold mines, for the yield of the white metal is nowadays so largely a by-product in the exploitation of ore deposits containing gold and copper, that the really distinctive silver mines of any magnitude can be counted on the fingers of one hand.

The Broken Hill Proprietary mine, in New South Wales, continues to be at the head of all the productive silver mines of the world. Next comes the Tonopah Mining Company of Nevada. It may be claimed that the Federal Mining & Smelting Company should be given second place, because it makes a production bigger than that of the Tonopah, but the Federal Company is a consolidation of five properties. They are neighbors of the Bunker Hill & Sullivan, in the celebrated Cœur d'Alene district. The following data will be of interest:

Company.	Tons of ore.	Ounces of silver.	Profit.
Broken Hill Proprietary Co.			
Year ending November, 1906	523,551	4,615,430	$2,954,110
Bunker Hill & Sullivan Mining & Concentrating Co.			
Year ending November, 1906	338,879	1,598,426	2,435,016
Federal Mining & Smelting Co.			
Year ending August 31, 1906	874,332	3,920,884	2,685,213
Tonopah Mining Company of Nevada.			
Year ending December 31, 1906	66,586	3,194,309	1,379,867
Tonopah Belmont Development Co.			
Year ending December 31, 1906	16 153	933,981	386,721
Anaconda Copper Mining Co.			
Year ending December 31, 1906	1,494,828	2,979,908	8,842,669
Nipissing Mines Co.			
11 months ending March 30, 1907	2,432	1,482,767	841,241

The mine last mentioned affords a curious contrast with the others in point of tonnage, for the Nipissing ore is specimen stuff carrying slabs and masses of native silver, in association with cobalt. Of cobalt ore 31 tons were shipped. This mine is in the Cobalt district, of Ontario, Canada, and has been rendered famous both by its richness and the manipulation of its stock. As the Huanchaca mine in Bolivia has ceased to be highly productive and the Leadville mines are valuable as much for their zinc and iron ore as for their silver and lead, there are not many silver mines of the first rank. The Iron-Silver Mining Co. of Leadville produced $1,089,808 in 1906 and made a profit of $515,127. The yield included 425,050 oz. silver, 2,043 oz. gold, 69,477 lb. copper, 4,542,938 lb. lead, and 61,738,134 lb. zinc. The multiplicity of metals is typical of Leadville at the present time. This varied output came from 145,120 tons, of which 139,049 tons are credited to the Moyer mine. The Anaconda Company's mines at Butte, produced 2,979,908 oz. silver during 1906, as an incident in copper mining. The copper mines of Bingham also yield silver, although the amount is not enough to rank them individually as important producers of silver. The Tonopah ore contains a large proportion of silver, with the gold. The premier mine of that district, the Tonopah of Nevada, yielded $2,463,200 in 1906, the ore containing 3,194,309 oz. silver, and 36,068 oz. gold. This mine is paying quarterly dividends of $350,000, of which one quarter comes from the Tonopah & Goldfield Railroad Co. During 1906 it earned $1,379,867 in profits, from 66,586 tons of ore, while the neighboring Belmont mine earned $386,721 in profits from an output of 16,153 tons, producing nearly a million ounces of silver.



Belle and Diamond Mines of the Anaconda Copper Mining Company.

The three chief sources of lead are quoted herewith and with these figures we give the dividends paid by the mining companies, whose silver production has already been stated.

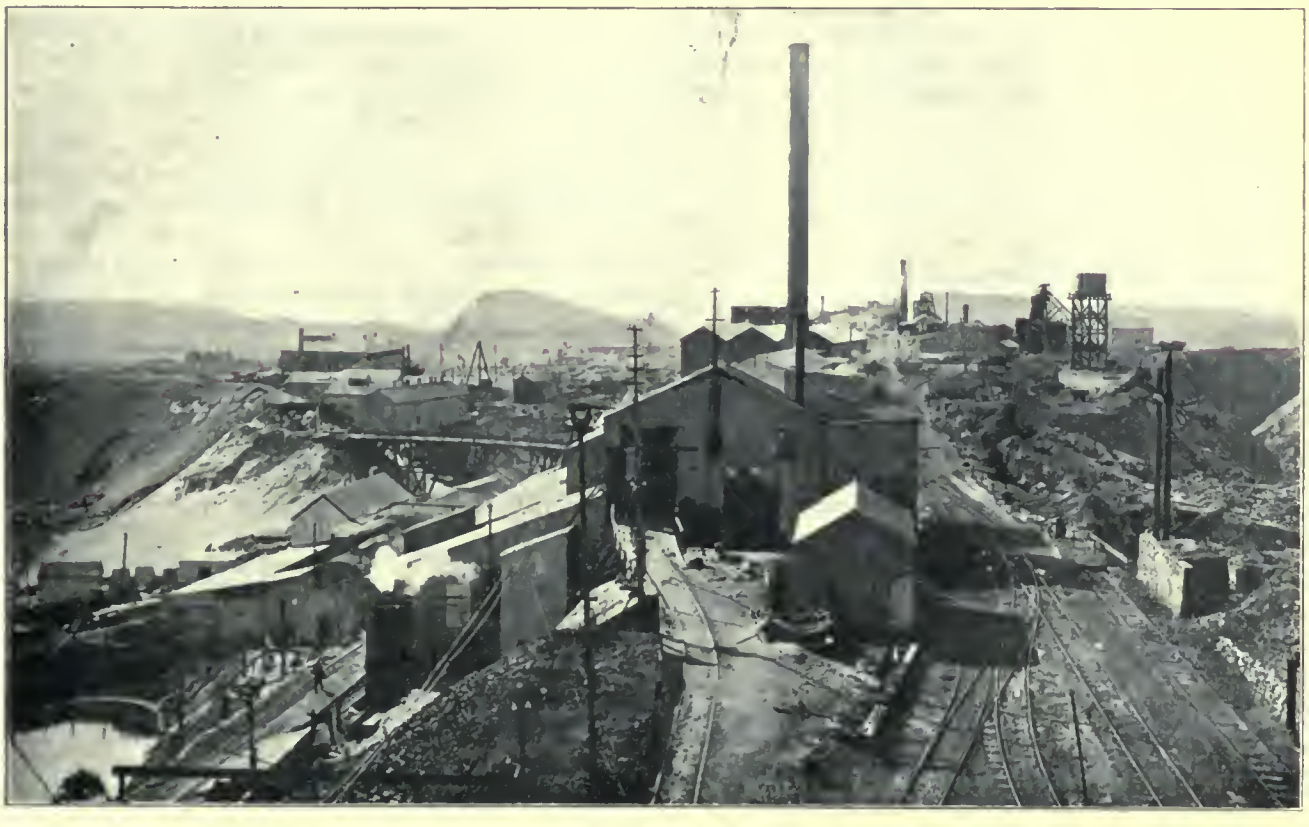
Company.	Lead. Tons.	Dividends.
Broken Hill Proprietary		
Year ending November 30, 1906	57,248	$2,095,200
Bunker Hill & Sullivan		
Year ending November 30, 1906	40,133	2,280,000
Federal Mining		
Year ending August 31, 1906	63,029	1,647,456

At the last meeting of the Broken Hill Proprietary Company, it was stated that the Barrier district had, since its discovery in 1885, yielded 20,000,000 tons of ore, from which 2,500,000 tons of lead and 250,000,000 ounces of silver had been extracted. The value of the product was £60,000,000 or nearly $300,000,000, while the dividends paid aggregated £13,750,000 or $66,687,500. Of these dividends the Broken Hill Proprietary Company

has paid $44,387,200 on a capital of £384,000 or $1,862,400. In the year ending May 31, 1891, this mine produced 242,557 tons of ore, yielding 8,790,670 ounces of silver and 38,563 tons of lead, valued at $5,507,508. During the last six months 121,895 tons of tailing were treated, producing 32,181 tons of zinc concentrate. This is a comparatively new source of revenue and it promises to grow to much larger proportions.

It may be added that the mines of British Columbia yield about 30,000 tons of lead annually, and 3,000,000 ounces of silver. The Joplin district in Missouri contributes 17,000 tons of lead and the counties of St. Francois and Madison, also in Missouri, produce 90,000 tons, out of the 350,000 produced in the whole United States. The total production of the world is about 1,200,000 tons. Germany yields 150,000; Mexico, 100,000; Australia, 120,000 tons.

While the production of lead is increasing, in response to the higher prices for the metal and the greater skill in milling methods, it is noteworthy that there is no such activity in the search for new mines as there is in the exploration for copper deposits.



The Broken Hill Proprietary Mine.

THE mines department for the colony of Natal has just given out a preliminary statement of the colony's mineral output for the year 1906. We are informed that the mineral output was valued at $2,573,472, and consisted of 1,238,713 tons of coal, 50 tons of lime, 73 oz. gold, and 3 tons of copper ore, the last named being only for samples. During 1905 prospecting was carried on for both asbestos and graphite, but nothing was done last year toward their development.

NOTICE.—THE STANDARD CONSOLIDATED MINING Co., of Bodie, Cal., is in want of experienced miners and laborers for general work; miners can earn $4 and laborers $3 per day; pay is prompt and steady work is assured to good men; board and lodging cost $26 per month and the climate and work are healthy.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The mineral sent from Placerville by G. is Gypsum.

The rock sent by W. F. W., of Shingle, Cal., is a Shale.

A volcanic Tuff was sent by T. A. B., of Breckenridge, Colorado.

W. H. W., of Amalie, Cal., sends: No. 1, Pyrite and Arsenopyrite; No. 2, Sphalerite.

The specimens sent from Woody, by J. W., are: No. 1, Chalcedony; No. 2, decomposed Biotite; No. 3, Tremolite; No. 4, Pectolite; No. 5, silicified rock stained with Limonite; No. 6, brown Garnet.

From J. W. at Calumet, Mich., we have received a specimen of Chalcocite, with native copper.

The mineral from Guerrero, Mexico, sent by W. N., is Torbernite, a phosphate of copper containing uranium.

ONE OF THE INTERESTING FACTS presented in the statistics of coal production last year is that West Virginia has supplanted Illinois as the second coal-producing State, West Virginia showing a total output of 43,276,185 short tons, while the production of Illinois was 41,497,435 short tons. This was due principally to the almost complete suspension of mining in Illinois (as in other States where labor union forces were strong) during all of April and a part of May, where the miners and operators were in conflict over the wage scale, whereas the majority of the operations in West Virginia were more actively worked, as a result of the suspension of work in the other districts.

The Work of a Purchasing Department.

In the case of small mining properties supplies are secured and distributed through the superintendent or manager, and in such case there is no need of a purchasing agent. With the growth of the company, or with consolidation, these duties have had to be specialized and put in charge of an officer that devotes his whole time to them. The men that are to use supplies, and he that buys them, should work hand in hand. The purchasing agent should, for example, consult the blacksmith regarding the grade or make of steel; the carpenter, regarding the grade of lumber; the master mechanic, as to castings or metals. The agent must try to get the best material at the lowest price, but it must be material that will be used intelligently by the different departments, a material that has been recommended by the superintendent or foreman of that department. The special and expert work of the purchasing agent lies in his constant watchfulness and study of markets and prices, in order to be able to take advantage of market conditions, and to act accordingly. He should be anticipating his wants and looking ahead, so as to be a judge of the future, of the upward or downward swing of the markets, buying liberally in anticipation of a rise in prices, and covering only immediate needs when there is a prospect of a decline. One way to keep informed is to note in the daily papers, and in Dun's and Bradstreet's reports, the trend of business conditions. The trade journals, such as the *Iron Age* and the *Commercial Bulletin*, give the trend of the markets. There are certain lines of materials, like iron and steel, that have a way of indicating general business conditions. In fact, it seems that other lines of business follow along, and when the slump or rise comes in these staples, one may expect to see other material affected in like manner. Another way in which the purchasing agent is bound to absorb much information of this kind is by keeping in touch with, and by frequently seeing and talking to, the representatives of the trade. These men, many of them, are as well posted in business affairs pertaining to mining supplies as can be found, and are most willing to talk prices and discuss the outlook. The element of personal judgment comes in here, and the purchasing agent soon learns to get at the facts. Today, as never before, we are up against a combination practically without competition in iron and steel prices. The United States Steel Corporation makes prices, and all have to follow. They control also the prices in pipe, and in a large measure, fittings. Much of the purchasing agent's business is likely to be done by telephone, and to be able to conclude business quickly and without reference to books or memoranda, he should have much of his knowledge well in mind. With so much to learn and to think of, he has but little time to give to private business or speculation—in fact, to anything beyond his recreations and necessary social duties.

Previous experience in mining work leading up to the position of purchasing agent is of considerable advantage, and gives a man much more confidence in his reports and correspondence, and, in fact, in all his negotiations. Knowledge of how freight is handled assists in getting material to its destination—no small part of the work. He should be posted on the general make-up of supplies to enable him to judge as to what shipping directions to give out, whether by mail, express, by boat, or by all-rail, and to be fully informed as to the routing of materials by certain lines and connections, and in regard to the probable time of delivery. A general idea of accounts and an understanding of office detail is also a valuable qualification, though not so important.

The purchasing agent is appointed by the manager and so reports to him. Sometimes he is classed in the operating department, but he more properly belongs in a department by itself, since the work differs from any other. He has authority over the material required for operation, not how or where it is to be used after he has secured it, but in seeing that the company has the right standard for its needs, and that it has been obtained at a satisfactory price. This is really the heart of his work. His advice is asked, and cost-reports on materials are called for in case of expenditures for improvements and additions. He is in position to know when best to purchase material for this extra work and improvement, and in this way he can render valuable service.

The scope of the purchasing department may be divided into two heads:

(1) Producing supplies. This includes the purchase and, after purchase, the delivery of material to its destination.

(2) The conservation of supplies or stores-work.

Beginning with the first head, the purchasing agent should be both in the office and in the field. The offices should be in charge of an assistant with a sufficient force to prepare and attend to orders, vouchers, invoices, and the necessary correspondence, and to turn out the work satisfactorily and promptly, subject to the supervision and direction of the purchasing agent. In the field he attends to the fuel, the timber, and lumber, and to the general stores needing his special attention. He also looks after the supply of fuel, both the proper kind and for the proper amount. If there are actual or threatened strikes in the coalfields from which the company draws its supplies, he must take action to protect the company in event of shortage. He is responsible for the inspection of the timber and lumber in quality and in quantity, and is looked to for the results of economy and good service.

Now the question may be possibly raised here: How does the purchasing agent know how much and what material to buy? Whence comes the information? The basis on which he works is the requisition. Requisitions show the quantity and kind of material, what it is to be used for, and how soon it is wanted. The departments using the materials make the requisitions, which are compiled under the direction, and with the approval, of the heads of the departments. These requisitions may be forwarded through the general storekeeper to the manager before they reach the purchasing agent. There are, however, exceptions to this rule, as when, in an emergency, the material is ordered by telegraph. In a case of this kind the purchasing agent may be expected to see that the cars for the materials are procured and placed promptly, and that the material is loaded and shipped without delay. Any delays in such instances are apt to mean increased loss, and of necessity such emergency supplies cannot wait for requisition procedure. Requisitions, having received the proper approval, come to the purchasing agent's office for his action. Some of the material, the price of which has been secured on contracts, which he has already made for a period of time, may be ordered at once. Material not contracted for is listed and sent to supply-firms with the request that they make bids. In this way, by the operation of competition, the lowest prices are secured consistent with the grade and quality of the material specified. When the bids have been received the orders can be placed, but considerable judgment is required in selecting the right bid. As a general proposition, the lowest bid takes the order. But besides the price, other things must be considered, as, for instance, whether or not the bidder can deliver the material within the required time, and whether from his past experience the purchasing agent

may be sure that the lowest price quoted covers the quality and kind of material wanted. These negotiations are often carried on verbally, as well as by correspondence, and at times a verbal arrangement may be better. Throughout the negotiations it is essential that the business be handled promptly, and that no efforts be spared to cover all points before the order is finally placed.

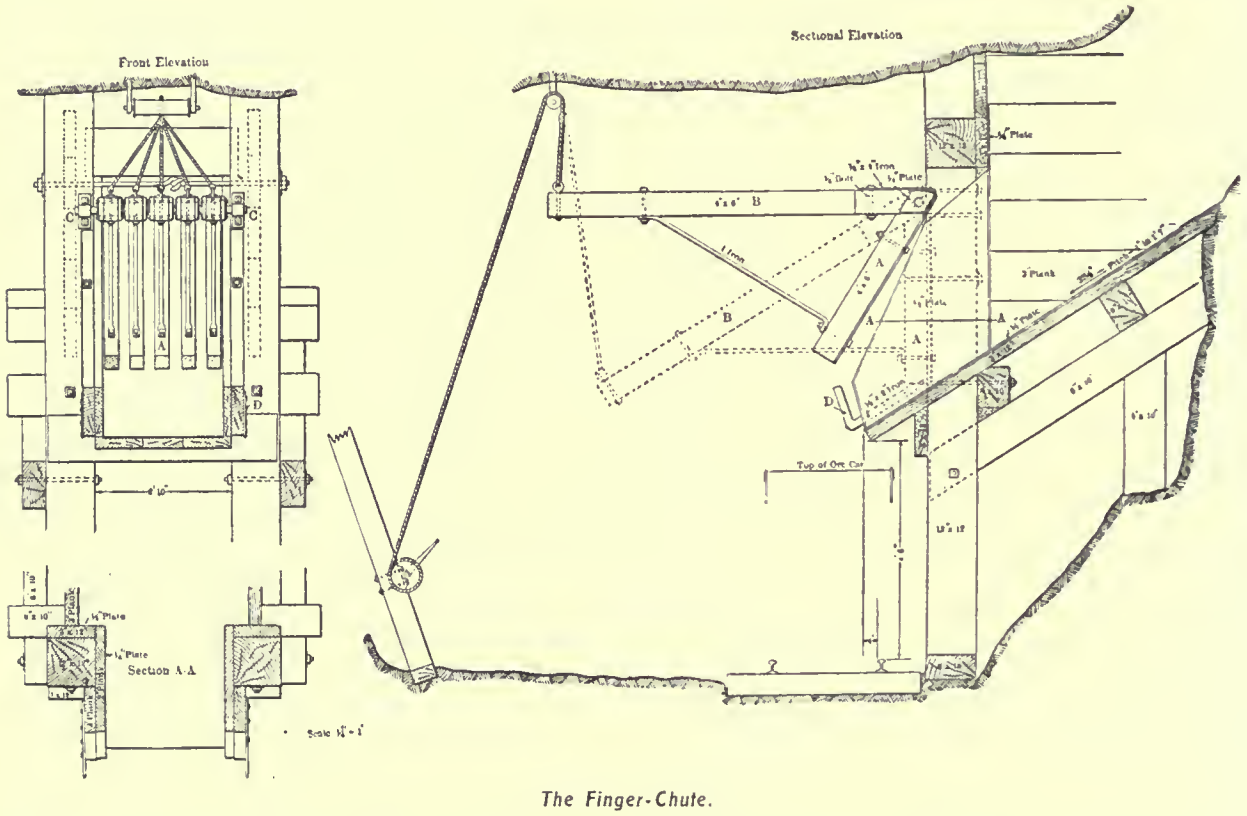
Regarding the question of quality and the inspection of supplies, the purchasing agent may often not know whether such material comes up to the required standard or quality. He is protected, however, by those who are naturally inspectors, as they are users, of it. It is a rule that when material is received that is inferior, or does not conform to specifications, it must be at once reported, or, if necessary, rejected. This information will come immediately to the purchasing agent, sometimes with much emphasis. He thus has a check on the quality of the material, and where specifications have not been complied with, the offending supply-firms are the losers. Owing to this natural safeguard, such mishaps are rare. To secure a standard of quality the specifications referred to above are printed and furnished to intending bidders. These specifications are prepared by experts in any department, who are to use such materials. While they do not cover everything which is bought, they furnish a substantial foundation upon which to base purchases. The users of the materials must see that they come up to the specifications. The mere purchase of material by no means completes the work; when orders are placed and accepted they must be followed up to see that the material meets no transportation or shipping delays. What are known as 'tracers,' both written and telegraphic, must be sent out in order to follow and hasten shipments of material that has been delayed, or which it is hard to secure after it has been ordered. There is, perhaps, no limit to the effort that may be thus spent. As to the kind of material that may be bought on time or other contracts, there is no rule other than the condition of the markets and the amount of a given kind needed. It is always safe to contract for fuel, mine timber, and for other material used freely and constantly. Such contracts are made subject to the judgment of the purchasing agent. As regards the conservation of supplies or the stores-stock, this is looked after by a storekeeper reporting to the purchasing agent, but sometimes to the superintendent or manager. A record of all materials purchased, as also a record of the requisitions, should be kept by the storekeeper. While all material is not delivered direct to the storehouse, some being delivered direct to the place where it is to be used, the storekeeper is expected to have a record of the material, quantity, cost, and by what department used. There are also many classes of materials, such as lumber and hardware, that must be kept on hand to be issued to different departments; they are to be bought in quantity and issued as needed. This stock, which may be termed 'running supplies,' is replenished as often as necessary by the purchasing agent on requisitions (properly approved) as received by the storekeeper. The storekeeper in turn issues these supplies from the storehouse on requisitions termed 'store-stock requisitions' or 'orders,' received by him from the foreman of departments or their agents. With his assistants, the storekeeper is expected to know at all times the condition of his stock, so that he may not run out of any item, and that he may know when and how much to order. To do this he may use a card system, or better, a loose-leaf system in which materials received are debited and issued credited to the storehouse. Such a system, to have value, must be vigilantly kept. Beside this system there should be a semi-annual inventory by actual count and measure. It is a test of the efficiency of a storekeeper to keep down his stock to the lowest practical working point, in order not to have more money than necessary tied up in material. For the purpose of facilitating the issue of these stores to different points there may be one or more outlying stores taken care of by a special clerk, accountable to the general storekeeper.

DEVELOPMENT OF ECUADOR.—Advices from Quito state that a contract has been signed by the minister of the interior authorizing the formation of The Eastern Ecuador Exploration Co., to be incorporated in London or some other place approved by the Government of Ecuador, to carry out the following objects: To construct a railroad from Ambato to some point on the Curaray river at or below the head of navigation; establish a port on the Curaray river at the terminus of the railroad; establish a regular line of steamers between the terminus of the road and the city of Para in Brazil, also to establish lines of steamers on any or all of the navigable rivers of the oriental region of Ecuador; explore the oriental region and exploit its riches, both mineral and vegetable; acquire temporary or permanent titles to mines, waterfalls, etc.; procure foreign immigration and provide for the settlement in this oriental region. The term 'oriental region' is defined to be all that territory lying between the eastern watershed of the eastern chain of the Ecuadorian Andes and the northeastern, eastern, and southeastern boundaries of the Republic, but the Government of Ecuador may fix the western limit of this region with greater accuracy if necessary or desirable. Plans for the railroad must be presented within one year from date of contract, and the capital which is used in the construction of the road will be repaid by the Government of Ecuador in bonds secured by special funds. When the plans for the road are accepted, permanent title will be given to the company to alternate tracts of land four miles wide along its entire length. Hydrographic and topographic maps of the oriental region must be completed by the company within five years from the time their work is begun and such maps will become the property of the Government. The company will have the exclusive right for five years to locate and file upon such properties as mines, rubber zones, etc., and to exploit such properties as may be thus located for 50 years; in the case of vegetable products title to the land which such products occupy is not conferred. Titles to mines may be acquired by fulfilling the usual conditions required by the Government of Ecuador and exploiting such property within 10 years from date of discovery. Employees of the company are prohibited by the Government from filing upon mining properties until they may have left the service of the company 10 years, unless permitted to do so by the company. Provision is made for fair dealing with Indians.

HYDRAULIC CEMENTS.—The hardening process of all hydraulic cements is mainly a process of formation of colloids and not a process of crystallization. The composition of the clinker is entirely immaterial to a certain extent, and many different compounds may be contained in the clinker; some of them are essential, while others may be present or absent, but no matter what the composition may be within certain limits, the hardening process invariably proceeds the same way and is due to the formation of a gelatinous substance, a colloid, which becomes solid in time and which is composed of calcium hydro-silicates, calcium hydro-aluminates, and calcium hydro-ferrites.

The Finger-Chute.

By request of several of our readers, we reproduce herewith a drawing of the finger-chute used in the Alaska Treadwell mine. This drawing is taken from the valuable paper by Robert A. Kinzie, appearing in Vol. XXXIV of the *Transactions* of the American Institute of Mining Engineers. From his description we quote the following: The so-called finger-chute is used throughout the island when a large amount of comparatively coarse rock is to be handled. The fingers are held in place by the weight of an arm, *B*, and are separately hung from the rod, *CC*, so that the motion of each is independent of that of the others. For the purpose of raising the fingers so that the ore can be drawn, to the top of each finger is fastened a piece of rope. These pieces are brought to a common centre and fastened to the main hoisting-rope, which passes over a pulley in the top of the drift and thence down to a small windlass. When ore is to be drawn, the fingers are raised to the height necessary to allow the ore to pass. When enough has been drawn, the fingers are released and fall into position, stopping the flow. If a large piece is caught on the lip of the chute, it will hold only the finger or fingers that come in contact with it, while the others drop to their normal position. To prevent fine dirt dripping into the roadway, a tail-board is put across the mouth of the chute and held in position by the angle-irons, *D*.



The Finger-Chute.

The cost of putting up chute-raise, cutting-station, and installing finger-chute complete, is as follows:

12 ft. of raise at $9 per ft.,	$108.00
80 cars of dirt at 20c.,	16.00
Cutting chute-station for windlass	40.00
40 cars of dirt at 20c.,	8.00
Building finger-chute,	17.58
Lumber, 700 ft. B. M. at $12.50,	8.75
Iron and steel,	40.00
Blacksmith-work,	7.00
Rope,	2.00
Total cost,	$247.33

The principal advantages gained by using the finger-chutes are dispatch in loading and freedom from blocked chutes and from spilling ore on the tracks. Their cost is prohibitive except where a large amount of coarse dry rock is to be handled, and in the Ready Bullion and Mexican mines they have been in a great measure superseded by the common board chute, which costs very much less. In the Treadwell they alone are used, and, as stated above, they are being put in at intervals of 20 and 15 ft., instead of 30 ft., as heretofore. The additional expense of putting in finger-chutes every 15 ft., instead of every 30 ft., is $8.33 per foot of drift. The saving in shoveling in a stope 60 ft. wide would be $12 per foot, making a saving of $3.67 by additional chutes; to which must be added the advantage of not losing time by chutes getting blocked. With chutes 15 ft. apart, the train can move with brief stops and be practically drawing from the same part of the stope. The blocked chute can be freed by one man and not delay the train more than 10 minutes. Also, in case the back of the stope should become so bad that men could not get in to work the ore into chutes, more than twice as much could be drawn from the stope with chutes 15 ft. apart.

A modification of the finger-chute is used for the skip and bin-chutes. They are made with six fingers and are 6 in. wider than the ordinary chute. A trough is added to carry the ore from the lip to the edge of the shaft. It is 9 ft. long, 3 in. wide, with an inclination of 36°, so that the ore will run freely from the lip to the skip. Attached to the end of the trough is a hinged door made of half-inch steel plate. When raised, it immediately and entirely stops the flow, and allows the trough to be filled in readiness for loading the next skip. It takes on an average 20 seconds to load a 4-ton skip and make everything clear for hoisting.

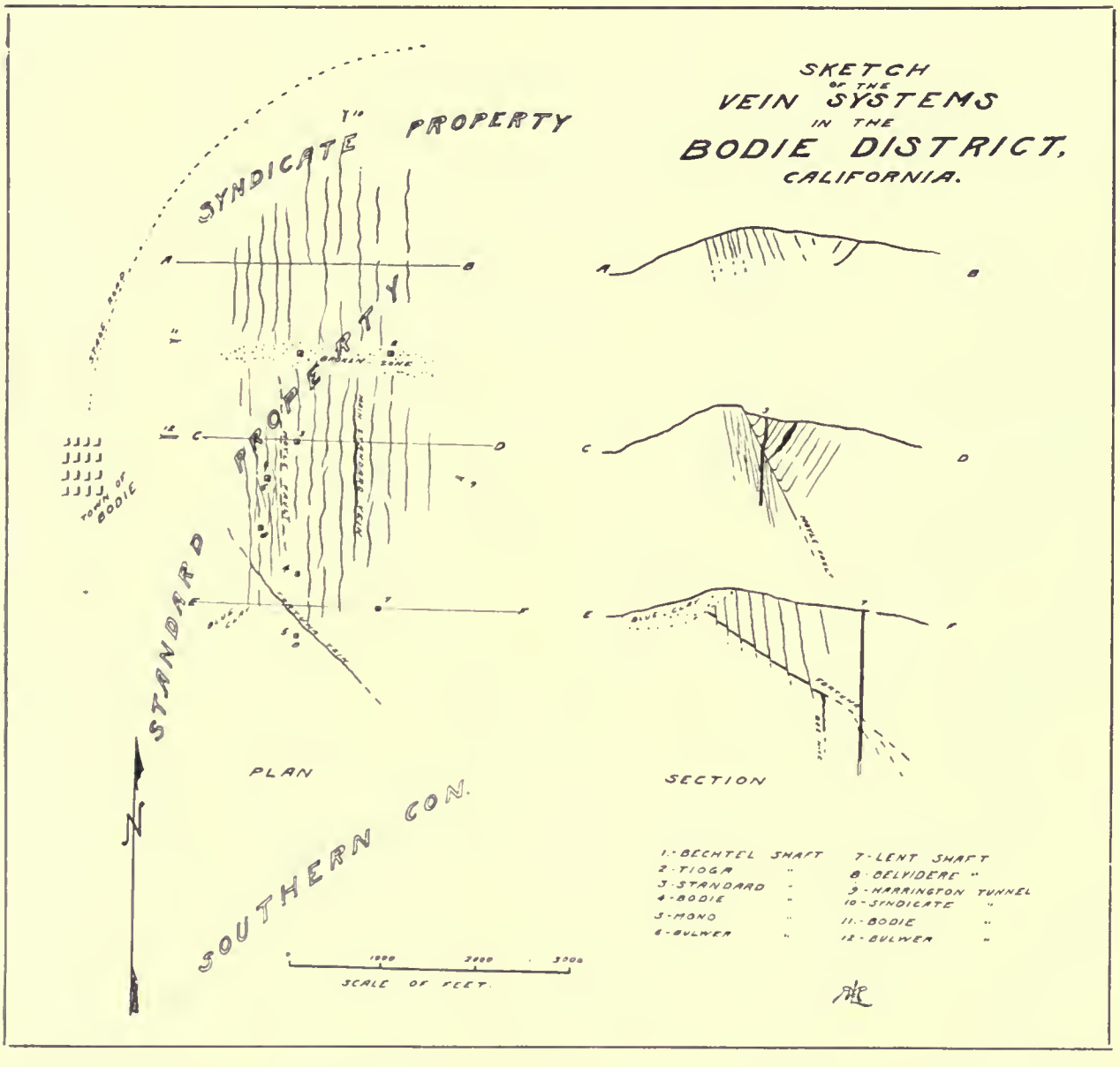
SUEZ CANAL PETROLEUM PROHIBITION.—The prohibition against carrying petroleum through the Suez Canal, which has been in existence for many years, has been removed. What this concession means to the users of this commodity will appear when it is stated that no less than 250,000 tons of petroleum are brought in bulk yearly to Europe from Borneo and Sumatra; and not to Europe only is the import made, but also to the United States.

Geology of the Bodie District, California.

Written for the MINING AND SCIENTIFIC PRESS
By R. P. McLAUGHLIN.

The following description of Bodie is offered because but little has been published upon this mining centre which, at one time, ranked among the foremost gold districts of California, its large production corresponding in a way with the present conditions in neighboring districts of Nevada.

The Bodie district is situated in Mono county, about six miles from the State boundary line between California and Nevada, and almost due east from San Francisco.



The nearest station is Thorne, at the southern end of Walker lake, in Nevada, on the Colorado & Carson railroad. The stage journey of forty miles west takes one past the old camp of Aurora and into the town of Bodie, at an elevation of 8,200 ft. above sea-level.

Historically the camp offers all the picturesque features portrayed in the stories of Mark Twain and Bret Harte. The "bad man from Bodie" was a phrase current throughout the Western States a few years ago as indicative of all that was rough in character. Gold was known to exist here in the early '60s, but it was not given much attention until about 15 years later, when rich ore was found. The boom days of the Comstock were almost past and the rich strikes at Bodie attracted the population of Virginia City in a rush probably as maddening as any of recent years. It was hoped that another Comstock lode had been found and the town became a miniature Virginia City with all of good and bad that the name stands for in mining and finance. At one time there were 30 companies operating hoists within the area of a square mile and a population of 10,000 was claimed for the town. The collapse of many ventures left the hillside strewn with monuments of reckless expenditure based on wild hopes.

The country for a number of miles around Bodie is andesite and volcanic mud containing fragments of andesite. The andesite is probably a surface flow on top of slate and shale, which are exposed several miles to the south, turned up at a steep angle as though by the Sierra Nevada granite, which extends along those mountains about 15 miles west of the district. In some of the underground workings near the Lent shaft, at a depth of about 500 ft., are found inclusions of black chert possibly altered from the underlying sedimentary rocks. Although the Bodie district has turned out several million dollars in dividends and is still a steady producer, and the only important mineralized area yet developed in the large county of Mono, no work has been done there by the U. S. Geological Survey. A few years ago, assistance was offered, by one of the Bodie mining companies, to take up this work, but it was refused by the Survey, on the ground that there had been criticism on some of its work as "post mortem." Other work has

been carried on, in the Mono Lake basin and on the glacial deposits flanking the Sierra Nevada, which resulted in interesting reports of doubtful economic value. The postponement of work at Bodie until its regular turn among the quadrangles, will reduce the chance of rushing into an "ante mortem" examination.

The gold-bearing quartz veins are confined, as far as present developments have shown, to a single ridge about one mile long in a north and south direction and about a quarter of a mile wide. This ridge is readily distinguishable from the surrounding hills by its light color in contrast to the dark rock extending for miles in each direction. Two theories would account for the formation of the hill. One is that it is a volcanic neck pushed up through the surrounding igneous rock (similar to the occurrence at Tonopah), and the second theory is that the ridge rock is the older and has been exposed by erosion, being preserved above the surrounding country by its greater hardness (as at Goldfield). Geologic work that would establish the relation of this hill to the rest of the country should prove of great service in prospecting.

The veins are 'true' fissures in the andesite, carrying gold and silver in about equal amount, and nearly all of them strike north and south with the ridge, varying but little over 10° either way from a vertical dip. The accompanying sketches are drawn to show the general structure and exact measurements are neglected. Most of the veins are from one to three feet wide and occur from three to one hundred feet apart. The ore-shoots are from 20 to 200 ft. long and dip southward in the veins.

A larger portion of the productive area has passed into the control of the Standard Consolidated Mining Company and my observations have been confined mainly to the extensive workings on this property. The Syndicate property to the north of the Standard has been developed by adits to a depth of about 500 ft. The Standard shaft is 1,000 ft. deep, there being about 400 ft. of water in it at present. The Southern Consolidated property, south of the Standard, has been opened by shaft and other workings to a depth of over 600 ft. The greatest depth attained in the district is at the Lent shaft, which is 1,200 ft. deep, over 600 ft. being under water now. Almost without exception the veins have failed to carry pay-ore to a greater depth than 500 ft. below the surface, but the great number of veins (over one hundred) and the great width of at least one (the Main vein of the Standard was worked by square sets; it was 60 to 70 ft. between walls at its widest, the ore being worth frequently $400 per ton) have made a long life and large production possible. Outcrops of encouraging size and value are rare, being obscured by surface debris and also pinching out. Nearly all the discoveries have been made by cross-cutting. The size and value of the veins vary so much that cross-cuts more than 200 ft. apart may entirely miss orebodies of considerable value.

A marked geologic feature exposed in the workings is a fault-plane (locally called the Moyle foot-wall) extending about 2,000 ft. north and south and dipping about 60° east. The present caved condition of the old workings prevents a study of this fault as far as is necessary to establish its relation to the vein systems. This fault-plane was once the basis of an apex suit, the contention being that it was the main lode of the entire system. Broken pieces of ore and clay fill the fissure, but it has never been worked as a vein. Consolidation of the contesting companies waived the necessity of a final legal decision after one jury had brought in the non-committal verdict that each party to the suit should be awarded what really belonged to it.

The Standard shaft cuts the fault-plane at a depth of about 500 ft. and settling due to stoping on the east, or hanging-wall side, has caused a scarp of 12 ft. on the surface, moving the collar of the shaft the width of a compartment (5 ft.) diagonally out of line to the north and east. The veins break and bend upward as they near the fault from the east side, showing the faulting to have been normal, as is the case in all the other faults observed. The veins on the west side are in very solid country and are undisturbed. More evidence is needed to establish the relation of the veins on the two sides of the fault, as a very great movement would be required to displace a single vein system into the present position, as shown in the sectional sketch.

About 700 ft. north of the Standard shaft there is a broken zone not less than 100 ft. wide north and south and of indefinite extent east and west. The zone is composed of leached andesite and clay, which is probably the final product of the leaching. There are also occasional fragments of quartz. This zone is probably an area of faulting and displacement of later date than the vein formation. North of the zone the vein system as far as developed seems to be the same as in the section at the Standard shaft with the omission of the Moyle fault-plane, which is not traced underground and gradually disappears on the surface as the scarp is followed either way from the Standard shaft. An old property line is near this zone; in the leached and crushed rock the Tioga shaft was sunk to a depth of about 800 ft., cross-cuts being run east and west from each 100-ft. station. No ore was exposed by these workings and they were abandoned, although recent developments have opened up the vein about 400 ft. farther north, and these veins are now supplying most of the ore produced in the district.

Southwest of the Standard shaft there is an area of blue clay, exposed by the underground workings but concealed on the surface by talus. Striated surfaces in this clay show movements in all directions and the entire mass may be decomposed andesitic talus.

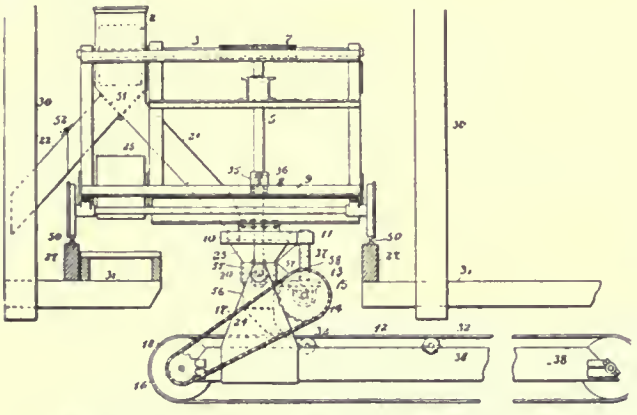
The oldest vein in the series is the Fortuna, lying in the southern portion of the Standard property and apexing in the mass of blue clay. Its strike and dip, so markedly different from that of any other veins in the district, make it remarkable, aside from the fact that it has been one of the richest. Where the younger veins cut the Fortuna, it is normally faulted from one to ten feet. The younger veins are said to have been enriched at the junction and none of them were worked out below, indicating an upward circulation of the ore-bearing solution through the Fortuna. If any of these junctions were still undisturbed by mining operations they would doubtless show important evidence in regard to age of veins and time of movement. The lower workings on this old vein are under water from a depth of about 500 ft., but accounts seem to show that it split up and was lost at the bottom. Near the present water-level is the open stope on the only vein worked below the Fortuna, called the Bee Hive 'dropper.' The Fortuna continues past this junction without apparent change, while the 'dropper' does not extend up farther. Reports show this orebody to have been bottomed in less than 200 ft. below the junction. As will be seen from this description, the probable sources of the ore-bearing solutions are concealed below the water-level in the old workings.

Most of the veins show a banded structure and displacements of the bands show several enlargements of the fissures since the primary deposition. A peculiarity of the ore is the occasional occurrence of manganese dioxide in vugs. The dioxide is loose and clayey in texture and carries some silver to the exclusion of gold. The best assays are usually found on or near one wall or the other, as indicated by fine scaly gouge or by small blue spots (of telluride) in the quartz.

MINING AND METALLURGICAL PATENTS.

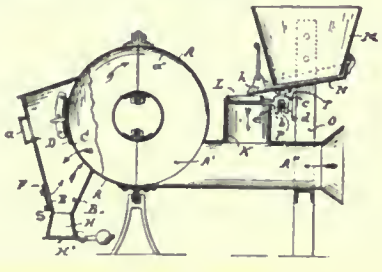
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ORE DISTRIBUTER.—No. 855,744; Philip Argall, Denver, Colorado.



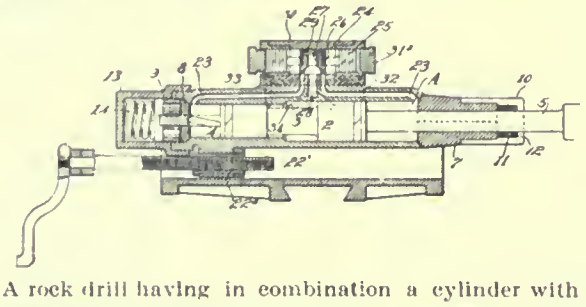
In an ore distributer, means for carrying pulverulent material to a required point, a conveyer mounted to receive said material as discharged, and to rotate angularly in a horizontal plane about said point of discharge, means to rotate said conveyer in said plane, means to cause a longitudinal travel of said conveyor simultaneously with said rotation, whereby the material is moved radially from the centre, and means connected with said conveyor for removing material therefrom during its outward travel.

CENTRIFUGAL CONCENTRATOR.—No. 852,558; Charles T. Heisel, Cleveland, Ohio.



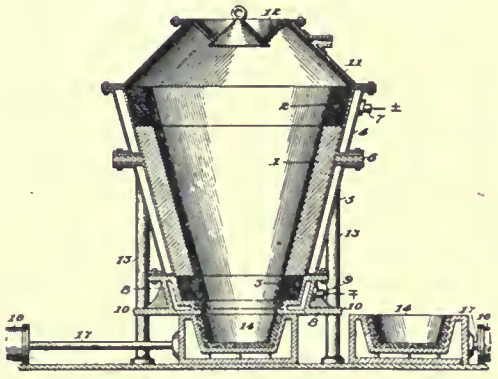
In a concentrator the combination of a helical conduit, a feeder therefor, suitable means for forming compartments at the side of the conduit having openings leading from the outer air into the conduit, means to vary the size of conduit openings, means to regulate the size of the outer air openings, means near the terminal of the conduit to induce an air-current therethrough, and also through the side compartments into the conduit through the outer air openings and the conduit openings for the purpose of regulating the discharge of the material into said side compartments.

ROCK DRILL.—No. 853,555; Edward Leichter, Nevada City, Cal., assignor of one-half to James C. Campbell, Nevada City, California.



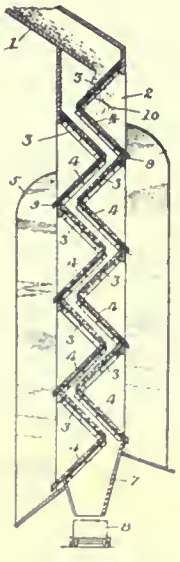
A rock drill having in combination a cylinder with tapered seats at the ends, a piston, front and rear heads having corresponding conical portions to fit said seats, the rear end of said cylinder having an extension beyond the adjacent seat, a chambered bonnet inclosing the rear end of the cylinder and receiving said extension and having a limited sliding movement relative thereto and a spring within the chamber of said bonnet.

PROCESS OF SMELTING REFRACTORY ORES AND PRODUCING FERRO-ALLOYS.—No. 855,478; Edgar F. Price, Niagara Falls, New York.



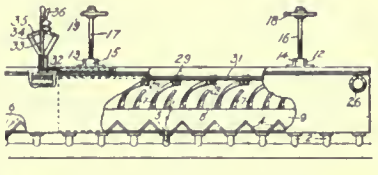
The process which consists in electrically smelting a charge containing a refractory ore, by means of an electrically-heated resistance-conductor, accumulating a body of the product, a portion of said body lying within a movable receptacle and a portion within the smelting chamber, and shifting the receptacle and thereby withdrawing its contents from the portion remaining in the furnace.

MINERAL-SEPARATOR.— No. 853,603; Charles U. Shepard, Summerville, South Carolina.



In a separator for granular material, means for supplying granular material to be treated, two series of screens located parallel to each other, and forming between said series of zig-zag path from the upper end to the lower end of the separator, the screens of each series being alternately of coarse and fine mesh, and a coarse screen of one series being located beneath a fine screen of the other series, so that the larger particles of the material are retained between the series of screens, and the finer material is discharged from the fine screens.

GOLD WASHER.—No. 855,640; Benaiah G. Jayne, New York, N. Y., assignor to Idanha Machine Company, a Corporation of New York.



In a gold washer or amalgamator the combination with a tank, of deflecting wings, means constructed to adjust the said wings, blades attached to the said wings and adjustable, also water-serving and jet-forming devices fashioned and disposed to discharge upwardly from the bottom of the tank toward the lower edges of the wings whereby the sand and water are deflected outwardly.

The Edwards Furnace.

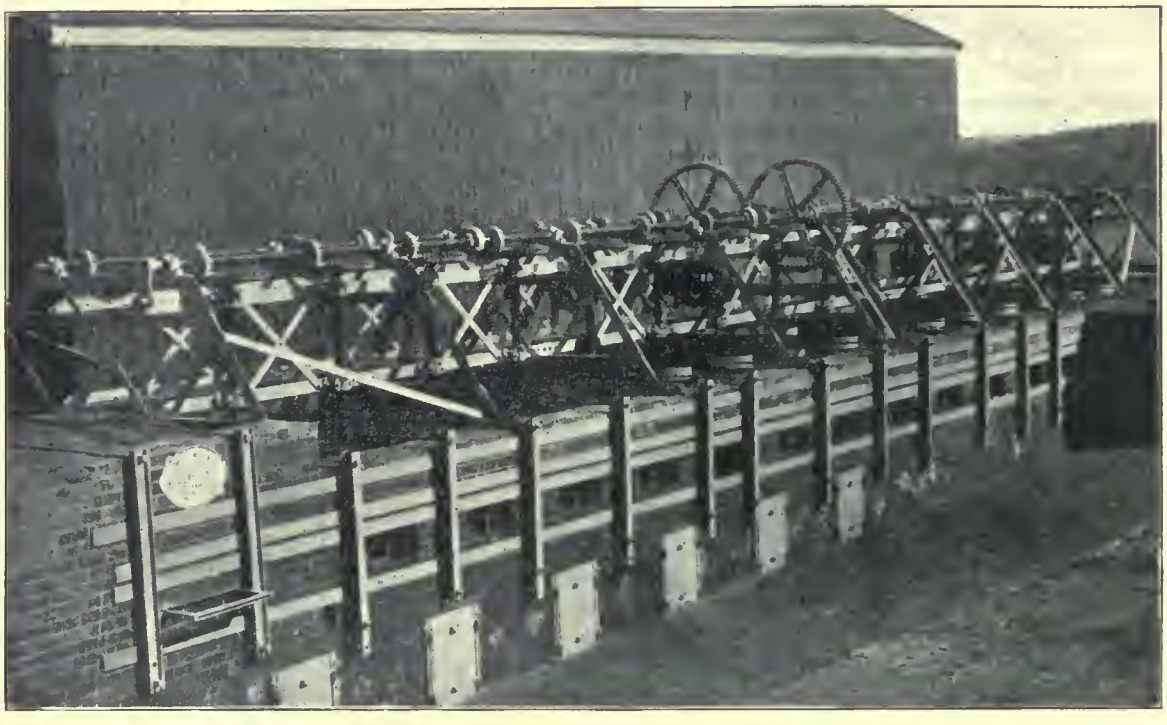
This furnace is now established in most of the States where refractory ores have to be cheaply and effectively roasted. It is operating on gold, silver, copper, zinc, lead, arsenic, cobalt, nickel, and other ores, and has proved a highly successful furnace for the treatment of sulpho-tellurides at Cripple Creek, having shown a saving of 50% in fuel and in operating costs as compared to other types of roasters. The roasting of the Cripple Creek low-grade ores cheaply and effectively, to enable good extraction in connection with modern methods of cyaniding, will increase the local gold production, as any mine can be furnished with its own individual equipment.

There are several types of Edwards roasting furnace, known as the tilting type, the simplex, and duplex, along with two other designs. One feature of these roasters is the fact that they can be arranged and erected to suit any particular problem in the roasting of a refractory ore. Four duplex roasters have recently gone into commission at the new Golden Cycle mill at Colorado City, and each furnace handles 100 tons of ore per 24 hours, giving a calcined product carrying about 0.008% sulphur. The power required amounts to about 5 or 6 h.p. The product is amenable to amalgamation and cyanidation. The tilting type of furnace is composed of two girders made in three sections. No single part of the furnace weighs more than 3,000 lb. Most of the parts do not exceed 250 lb. This furnace rests on pivots near its centre, and the output of the ore can be controlled by moving the furnace from the horizontal to any desired angle, thereby increasing or decreasing the discharge according to the refractory nature of the ore. The progress of roasting can be seen, and the action of the furnace is under the perfect control of the attendant; and a guaranteed sweet-roasted product is discharged in the best possible condition for chlorination, cyanide, or other treatment. It requires one horse-power to drive it.

The furnace is fitted with a series of iron rabbles, which rotate in opposite directions and are arranged to cut each other's circles. The spindles and feet of the rabbles are hollow, and are kept cool by a small constant flow of water passing through them. The connection with the main or stationary flue is effected by means of a frame having grooves, in which a thin plate of iron is moved up and down by the action of the furnace, thus covering the oblong opening and excluding the cold air from the flue; the frame is bolted to the flue.

The duplex furnace is a stationary structure, having a double series of rabbles, so as to treat a large tonnage. The rabbles are arranged to stir the ore at high temperatures as in the tilting type; this method of rabbling is effective in exposing all particles of ore to the action of heat and oxygen. The rabbling mechanism is supported and carried on the top of the furnace, all being firmly held in position by angle-iron brackets.

The wear and tear on these furnaces is exceedingly small, and the design is such that any repair can be rapidly effected. Any fuel may be used, as the furnaces can be heated with coal, producer-gas, or wood. One-half the fuel used in the hand-worked furnace is sufficient to roast the same quantity of ore in the Edwards furnace where the sulphur is utilized as fuel. This furnace is easily installed; the only foundation required is one small block of concrete under each pivot, and it requires 10,000 bricks to line it. It can be easily taken down and transported to any other locality.



The Edwards Roasting Furnace.

Trade Treatises.

ALLIS-CHALMERS CO., of Milwaukee, Wis., has published Bulletin No. 1,609, from the pumping-engine department, containing official duty-tests of pumping engines at Bissell's Point pumping station of the St. Louis water works.

THE ARTHUR KOPPEL CO. have issued an album containing a fine collection of photographs of various installations completed by this company at home and abroad. The views are grouped under geographical divisions, namely Europe, Africa, Asia, Australia, and America. The text of this publication is printed in German, French, English, and Spanish.

THE MCLAUGHLIN MANUFACTUING CO. issues an attractive catalogue on steam tractors. The new plant of the McLaughlin company is situated in the manufacturing district of West Berkeley, Cal. Their steam-traction engines are built on the designs of John McLaughlin, who has long been interested in the development of this class of machinery. They are now building powerful traction engines designed for the severest kinds of mountain and desert work and these will be employed in ore-hauling, logging, farm cultivation, and general freight. One of the attractive features of these engines, aside from their general efficiency, is that all of their parts are perfectly interchangeable.

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Editorial.

WITH THIS ISSUE, our subscribers will receive the index for the volume that covers the first six months of 1907. The punctuality in delivery of this index bears testimony to the harmony between the editorial, composing, and printing departments of this journal.

THE THIRTEENTH ANNUAL MEETING of the Lake Superior Mining Institute will be held on the Minnesota iron ranges, beginning July 24. Among the subjects to be discussed are mine sanitation and ore sampling.

IN THIS ISSUE the column usually devoted to the 'Prospector' is given to a short biographical sketch of the late Henry G. Hanks. He was a good friend to prospectors and miners, and they will not begrudge the space given to so worthy a memory.

FURTHER DISCUSSION on the relative merits of the reverberatory and the blast-furnace appears in this issue. Mr. James W. Neill, who started this useful debate in our columns about a year ago, returns to the charge with a number of pertinent observations and some valuable figures. We shall be glad to publish the views of other copper metallurgists.

TUNGSTEN is in demand. In California the only recorded shipment during 1906 was a ton of concentrate made from 15 tons of scheelite ore, at Paris, in Kern county. In Nevada, Round Mountain is yielding tungsten. Last week a shipment from this district in Nye county was received at Denver from the Monster mine. This carried 30 per cent tungstic acid and was worth $292 for 1,948 pounds of concentrate.

NONE of the bulletins of the United States Geological Survey will be more welcome than No. 287, which gives an account of the Juneau Gold Belt by Arthur C. Spencer. This covers the geology of the Alaska-Treadwell and adjacent mines on Douglas island, as well as other districts in southeastern Alaska. The Territory of Alaska has become a great mining region and in its development it has received invaluable aid from the scientific departments of the Government. The series of reports and bulletins on various parts of Alaska published by the Survey now constitutes a body of literature of astonishing breadth of treatment, practical usefulness, and scientific value.

MEXICO AND SAN FRANCISCO ought to be united by water transport of the best kind. It is stated that the Mexican Government has offered liberal inducements to the Vanderbilt system of railways to divert their traffic over the National Tehuantepec Railroad, and to estab-

lish a line of steamships between New York and Coatzacoalcos at the Atlantic end of the Tehuantepec railway, and between San Francisco and the Pacific terminus at Salina Cruz. Such an arrangement is much to be desired. Eventually even more direct communication with the City of Mexico and the central plateau ought to be established by a steamship service calling at the port of one or more of the railroads now in course of construction across the mountains that have so long separated Central Mexico from its coastal plain on the Pacific slope.

CHILE is likely to become an important source of copper within the next five years, that is, when methods of transport are sufficiently improved. The Braden Copper Company is building a narrow-gauge railroad from its concentrator at the Fortuna mine to Rancagua, a distance of 73 kilometres, and it is likely that this railroad will be continued to the Coast, where the smelter is to be erected. The Mining Exploration Company has built 70 kilometres of traction-engine road from Tinguiririca to the smelter site and has material ordered for 53 kilometres, of 60 centimetre gauge, from the smelter to the Choicas mine, which is on the eastern slope of the Andes, in Argentina, and at 10,000 feet above sea-level. A French company has taken hold of the Naltogua mine at Melapilla, in the Coast range southwest of Santiago, and is doing good work under the management of Mr. H. B. Hall, formerly with the Copiapo Company. These notes are indicative of the activity in Chile, and the probability that this South American republic will regain the importance in copper mining that it held a generation ago.

COMMUNICATION BY WIRE is almost cut off by the strike of employees in the service of the two telegraph companies, so that this week our market reports have suffered. The rights and wrongs of the quarrel are involved, but it is not likely that either of the companies will get much sympathy, having regard to their behavior during the time of the earthquake disaster. The Western Union Telegraph Company ought to have lost its franchise and ought to have been indicted for misappropriation of funds in April 1906, for at that time thousands of messages were taken, and paid for, which were not delivered, that is, the telegraph officials accepted money, ranging from 25 cents to dollars per telegram, for messages that they never delivered or else forwarded eventually and tardily by letter postage, the latter costing two cents. It is a curious fact that, beyond an ineffective resolution of the Grand Jury, nothing was done, then or since. It is to redress such wrongs committed against the public that Senators and Representatives are elected and it is disgraceful that the matter should never have been investigated, with proper punishment to follow. What we need is a Citizens Protective League to remedy such evils and compel irresponsible corporations to obey the law, under penalty of loss of the privileges given to them by the community in the interest of that community and not as a license to commit depredations in order to pay dividends on heavily watered stock.

NUMEROUS ARRESTS and indictments for misuse of the mails for fraudulent mining give testimony to the efficiency of the postal inspectors. We hope that the Post-Office Department will continue its useful work, for this is a greater deterrent to fraudulent mining than all the resolutions of mining congresses or the bills brought before legislatures, simply because it represents the enforcement of laws already on the statute book. In one case two mining engineers in good standing are arraigned and if they are guilty we hope that an example will be made of them; if they are not, they will do well to explain their action without loss of time. Our columns are always open to members of the profession when unjustly accused or improperly implicated in the affairs of promoters. In a recent issue we were glad to publish the disclaimer from Mr. A. J. Eveland, whose name had been used wrongly in the promotion of mines, or alleged mines, in the Phillipines. By his letter Mr. Eveland made his position clear before the profession, and if an engineer's record is clear before his profession, the opinion of the public, and especially the daily press, is of small account.

A Fundamental Problem.

DURING the past week we received a letter from a firm of brokers, asking for advice. It appears that the firm, consisting of two men, had endeavored to conduct an honest business in the promotion of mining property; the aim had been to acquire prospects and to develop them into productive mines, with no attempt to make a profit by selling stock or by any of the other questionable methods usually adopted in such cases. Prospects were purchased at the lowest prices and the management of operations was made as little expensive as possible. Out of five prospects, three proved worthless and were soon abandoned. On the other two about $65,000 was spent, under the advice of men that were believed to be competent. Finally, two mining engineers of experience were engaged and they have united in saying that the outlook for the two remaining prospects, now young mines in the extent of their workings, is hopeless. The brokers, one of whom writes to us in obvious good faith and gives these data, want to know where their methods were wrong and how to better them, in their own interest and in that of their clients. They complain that it is difficult to get an advisory engineer to give advice that is explicit and to the point. In any other form of industrial enterprise, it is possible to employ experts that will give concrete advice as to what to do and when to do it. Is mining only a gamble after all?

Perhaps one or other of our readers will be able to answer this question and give advice to these seekers after knowledge. We confess that it makes us feel ignorant when such fundamental queries are propounded. In the first place, undoubtedly, there is luck in mining; it is true that the most skillful and careful of men may be unsuccessful. As to prospects, they are like babies, their future is uncertain, even with the best of pedigrees and

the most favorable of environments; so a hole in the ground, even with a good-looking vein and a nice streak of ore, may 'go skat,' as the Cornishman says. A hungry looking trench may be an infant bonanza. The prospect next door to a great mine may prove no richer than the one that is miles away from anything with a record. This uncertainty is part of the charm of mining and it is an essential factor in speculation. But we try to minimize it, as we endeavor to eliminate uncertainties in all forms of industrial enterprise. The purely accidental element in the problem is overcome in part by securing the advice of experienced men, of those with local knowledge, of those credited with unimpeachable integrity. In many cases the best advice is not obtainable because the cost of it is fully equal to the price of a prospect; but most operators forget that the first cost is a small part only of the total expenditure. A prospect that costs $5,000 or $10,000 may have $50,000 or $100,000 expended upon it, before it is abandoned or proved to be a real mine. Thus costly advice, if good, is cheap in the end. Next, we allow the complaint that engineers often fail to be explicit, that is, they hedge; not being willing to endanger their reputation, they are apt to deal in generalities and give a report that will be fairly well verified no matter what happens. Here we take sides with the broker against our own profession. There is ground for complaint. An engineer is paid a fee to tell the truth fully and plainly; if he does not express a frank opinion and give his client the full benefit of his honest judgment, he fails "to deliver the goods" and he is unprofessional—which ought to be a severe term of reproach. If one man is paid $5,000 and another $500, it is not because the physical fatigue or mental labor involved in the inspection of a mine is less for one than the other; the larger fee recognizes the bigger reputation and is testimony to the fact that the engineer of acknowledged standing has more to lose by making an error than the other man, who may not have won his spurs. If then the $5,000 man hedges or reports in ambiguous terms or understates the ore reserves, he is not fulfilling his contract, which is to give his client the full benefit of his knowledge. On the other hand, it is likely that our friend the broker engaged local talent, that is, mining men interested in the development of the district, desirous of seeing money invested, sanguine as to the future of their own habitat and prone to see things through rose-colored spectacles. In boom camps the man of independent judgment is labeled a 'knocker'; to the enthusiasts around him he is but a poor pessimist. He is not likely to be engaged by a promoter, who naturally belongs to the most hopeful portion of humanity, whose geese may become swans, whose lame ducks may soar into the empyrean. It is a fact that if brokers with an honest purpose—to mine in the ground and not in the pockets of the public—do not turn to the better class of engineers in a mining camp, it is because they suspect the connection of such experts with some big corporation and they fear to risk their money and that of their clients in playing into the hands of such powerful organizations. This may sound silly, but it is one of the difficulties of the case. Most of the successful engineers are retained by, or have affiliations with, capitalists or groups of capitalists. Such a connection may either interfere with plain dealing or it may prove of assistance in the promotion of an enterprise, but it introduces another perturbing factor.

Therefore, the best advice we can give our correspondent the broker is not to put his eggs in one basket, not to depend for success on one prospect, but to try his luck with several. In the case mentioned, the number was five and that seems to have been enough for the capital available. Next, get good technical advice. If you cannot pay for it, stay out of the game. The excellence of the advice may be measured by its costliness, but not necessarily. Do not go to the mining engineers that are financiers, able to play their own game and that of rich clients, but rather choose the type of man that has been a mine manager, that has had more than a local experience, that is willing to express his judgment frankly, that makes your interests his own as long as you employ him. In the end, we find ourselves curiously in sympathy with the broker in search of a trustworthy technical advisor; nothing would aid well-intentioned speculators in mining, such as he, so much as the increase in the number of capable, honest, and independent mining engineers, not of the 'famous', 'distinguished', and 'well known' class, but just sensible and trustworthy fellows, able to give advice and willing to give it for a reasonable fee. The desire of this broker is the hope of our profession.

OUR LONDON CORRESPONDENT refers to the fact that Messrs. C. A. Moreing, H. C. Hoover, and a number of engineers associated with the firm of Bewick & Moreing have resigned from the Institution of Mining & Metallurgy. The matter has provoked much comment and it is altogether regrettable. We are informed that the resignations are due to offense taken by Mr. Moreing because he was not selected to represent the Institution on the governing body of the new Imperial College of Technology. While, as an ex-president of the Institution and a most successful mining engineer, he was well fitted for the appointment, it so happened that Mr. Walter McDermott was also nominated and as he had done most of the work of the Departmental Committee and was largely credited with obtaining recognition for the School of Mines as a separate body, he was chosen to represent the Institution. There may be other reasons for the resignations. It is known that Messrs. Moreing and Hoover have had some differences with the Council of the Institution previously, otherwise such wholesale resignations could not have occurred. Into the merits of the quarrel we cannot go. Among those that have resigned are several first-rate engineers and Mr. Hoover we consider one of the men best worthy of representing the application of the American idea to English mining enterprise. During the past year or two, the Institution has gained strength rapidly by reason of doing good work and it has become a real power for good. We hope that the incident will not be closed without some effort to restore harmony.

Personal.

J. W. MERCER is at Denver.

F. L. BOSQUI is at Goldfield.

LEWIS T. WRIGHT is at London.

GRANT H. SMITH, of Salt Lake, is here.

CHARLES BUTTERS has returned from London.

W. BLACKMORE is examining mines in Norway.

O. B. PERRY has gone from New York to Alaska.

FRANK KLEPETKO has opened an office at Lima, Peru.

R. H. CHANNING is on a visit to New York from Peru.

F. F. SHARPLESS has been examining mines in Idaho.

STANLEY C. DUNN has returned to London from Egypt.

LESLIE HALL is on a visit to London from Western Australia.

L. H. L. HUDDART is on a visit to England from East Africa.

FRANKLIN R. CARPENTER, of Denver, is in southern Mexico.

F. H. MINARD, of Denver, has been inspecting mines in Ontario.

S. H. BROCKUNIER, of New York, was recently in San Francisco.

FORBES RICKARD is examining mines at Central City, Colorado.

J. M. HYDE has returned to San Francisco from Guanajuato, Mexico.

WILLIAM BRADEN is expected at New York, from Chile, about July 15.

J. H. CURLE has been in Newfoundland. He is now on his way to Salt Lake.

C. W. GEDDES is making an examination of the Goldfield Consolidated mines, in Nevada.

ALEXANDER LEGGAT has retired from mining practice to become City Engineer of Butte.

ROY H. CLARKE, of Spokane, has been examining mines in the Oro Blanco district of Arizona.

L. H. DYKE has joined the staff of the Zaruma Mines Co. in Ecuador. He left San Francisco on June 15.

W. F. THORPE is directing the construction of the mill of the Veta Colorado Mining Co., in Chihuahua, Mexico.

EARL R. PEMBROKE has returned to Salt Lake, having examined mines in the Good Spring district of Utah.

GEORGE J. YOUNG, professor of metallurgy in the Nevada State University at Reno, is on a visit to San Francisco.

T. A. BUDD, of Buffalo, N. Y., who is operating mines near Walker lake, in Nevada, was in this City last week.

J. P. GAZZAM is at New York. He has resigned as general manager for the Nevada Consolidated Copper Company.

GEORGE D. BLOOD, of Salt Lake, has been engaged in professional work for the Silver King Coalition Mines Co. at Park City.

THOMAS COX, mine superintendent for the Nevada Con. Copper Co., has left Ely to accept a position with the Cerro de Pasco Co. in Peru.

POPE YEATMAN is now in entire charge of operations at Ely, for the Nevada Consolidated Copper Co. and the Steptoe Valley Mining & Smelting Company.

L. VOGELSTEIN & Co., New York, give the figures of German consumption of foreign copper for the months of January to April, 1907, as follows:

	Tons.
Imports of copper	39,059
Exports " "	2,834
Consumption	36,225
As against this same period in 1906 of	38,804

Of this amount, 31,103 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES—June 27.

Antimony	22.50@25.50c	Quicksilver (flask)	$38@39.50
Copper	25.75@26.75c	Spelter	7.75@ 6.50c
Pig Lead	5.85@ 6.80c	Tin	43.25@44.75c

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver
June 21	22⅛	5¾	6²⁵/₃₂	67⅛
" 22	22⅛	5¾	6²⁵/₃₂	67⅜
" 23	Sunday.	No market.		
" 24	22⅛	5¾	6²⁵/₃₂	67⅜
" 25	22¼	5¾	6²⁵/₃₂	67⅜
" 26	22⅛	5¾	6²⁵/₃₂	67¼
" 27	22⅛	5¾	6²⁵/₃₂	67⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	June 20. £ s. d.	June 27. £ s. d.	
Camp Bird	1 1 9	1 0 0	ex div.
El Oro	1 5 6	1 8 9	
Esperanza	1 16 3	2 1 9	
Dolores	1 7 6	1 8 0	
Oroville Dredging	0 17 0	0 16 3	
Stratton's Independence	0 3 3	0 3 0	
Tomboy	1 15 0	1 10 6	ex div.

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

SOUTHERN NEVADA STOCKS.

San Francisco, June 27.

Atlanta	$ 46	Laguna	1.00
Belmont	3.50	Little Tonopah	.....
Columbia Mtn	46	Manhattan Con	50
Combination Fraction	3.20	Midway	1.17
Daisy	1.60	Mizpah Extension	25
Fairview Eagle	.....	Mohawk	.....
Florence	4.15	Montana Tonopah	2.95
Gold Bar (Bullfrog)	62	Nevada Hills	5.25
Gold Bar (Goldfield)	.....	Red Top	3.25
Goldfield Con	6.87	Sandstorm	42
Goldfield of Nevada	1.25	Silver Pick	56
Gold Kewanas	73	St. Ives	98
Great Bend	62	Tonopah Extension	1.70
Jim Butler	1.05	Tonopah of Nevada	14.75
Jumbo	3.15	Tramp Con	60
Jumbo Extension	1.80	West End	85

(By courtesy of W. C. Ralston, 368 Bush St.)

COPPER SHARES—BOSTON.

Name of company.	Closing prices. June 27.	Name of company.	Closing prices. June 27.
Adventure	2½	Michigan	13¼
Ahmeek	.....	Mohawk	79
Allouez	45	Nevada Con	12⅞
Amalgamated	86	North Butte	80¾
Arcadian	5	Old Dominion	46⅜
Atlantic	12½	Osceola	.....
Balaklala	9	Parrot	.....
Bingham Con	15	Phœnix	.....
Boston Con	26¾	Quincy	114
Butte Coalition	24⅞	Raven	1¼
Calumet & Arizona	161	Rhode Island	5
Calumet & Hecla	800	Santa Fe	3
Centennial	26	Shannon	17¼
Con. Mercur	37	Superior & Pittsburg	15¼
Copper Range	79¼	Tamarack	105
Daly-West	15	Trinity	22
Franklin	14	United Copper com	62¾
Granby	125	Utah Copper	51
Greene-Cananea, ctf	16⅜	Victoria	7½
Isle Royal	20⅜	Winona	7½
Mass	5½	Wolverine	160

(By courtesy of E. F. Hutton & Co., 490 California St.)

COMSTOCK SHARES—SAN FRANCISCO.

	Closing Prices. June 27.		Closing Prices. June 27.
Alpha	05	Julia	07
Andes	16	Kentuck	10
Belcher	24	Mexican	42
Best & Belcher	70	North Gould & Curry	.....
Bullion	20	Occidental	38
Caledonia	15	Ophir	1.80
Challenge Con	15	Overman	12
Chollar	08	Savage	66
Confidence	75	Scorpion	08
Con. Virginia	61	Sierra Nevada	35
Crown Point	17	Silver Hill	55
Exchequer	39	Standard Con	.....
Gould & Curry	16	Union Con	26
Hale & Norcross	50	Yellow Jacket	88

General Mining News.

ALASKA.

NOME.

From the amount of preliminary work being done in the Council district preparatory to the opening of the summer season, it is evident that the district will be exceedingly busy during the next three months and will be a heavy producer. The dirt that was hoisted last winter has all been sluiced up, and everyone is looking forward to surface mining.—— William West has a force of men at work on the big ditch of the Wild Goose company.——The Blue Goose Mining Co. has its dredge running on Ophir creek.——Nick Obrodovich has just finished washing a $9,000 dump on No. 10 Ophir, which he has been working on a lay from the Wild Goose company.——R. E. Grinnel, superintendent for Ed. Dunne, has commenced ground-sluicing with two giants. The laymen operating on the ground of the Ophir Hydraulic M. Co. have washed up the winter's dump, with disappointing results.

Throughout the Kougarok district there is much activity, and the summer season will see a great advancement in this part of the country. The ditch company is especially busy getting the waterways into shape. The ground on Coffee creek and in Wonder gulch is showing up strong, and a new town will probably spring up at the mouth of Henry creek.

William C. Slade, who has been at the Inmachuk all winter for the Fairhaven Ditch Co., has left Nome with 120 men to finish the big ditch. A large dump has been extracted on the Utica group, owned by the Fairhaven company, and prospecting is being done in a number of places along the Inmachuk river, and several hydraulic elevators are being installed. —— Candle is having quite a boom, and everyone who had a lay seems to have struck pay-dirt. The snow left the northern country early this year, and was all gone on the Inmachuk by May 7. A. G. Blake has been surveying the Inmachuk coal mines for patents, and ran a line for the projected electric road. The mines are proving profitable and 40 men are employed. Around Nome, water is scarce on many parts of the tundra and many operators have not been able to wash up their dumps until the water is turned into the big ditches, which was done about June 26. It is impossible at this time to do any freighting over the roads, except those kept in condition by the Alaska road commission. The unexpectedly early break-up and run of water in the numerous creeks and gulches crossing the third beach line gave a great impetus to sluicing and cleaning up, earlier than in any previous season, and the strip of ground between Newton gulch and Little creek has been a busy place. Among the most prominent camps are: The North Pole fraction, worked by Lindsay and Murray; Bon Voyage, worked by Crabtree, Harding, and Waskey; the Wild Goose camp on No. 4 Newton; the Duplex fraction; Bear Cub, worked by Adams & Ashley and Christiansen & Olsen; Tidal Wave, worked by Tom Donahoe; Tom Doyle's camp, where $300,000 will probably be cleaned up; Diamond L., worked by Sam Samson; the Gertrude, worked by Doyle, Cole, and McCrea; the Cyrus Noble and Captain Sunback ground; the Bessie bench claim, operated by Denhart, Nixon & Bard, which is one of the richest on the third beach-line; the Mabel claim, the Pioneer company's ground, and hundreds of other camps that have good dumps and are already sluicing.—— The injunction order in the case of the Colorado & Cape Nome Mining Co. *v.* Graham et al., has been modified and the defendants will be allowed to wash up the dumps lying on the Philadelphia fraction, on the third beach-line.—— The ground on Shovel creek, that has been worked for two years by a dredge, will be exploited this summer by Charles Hedberg and John A. Webb. ——A large dump has been taken out on the first beach-line, on the Violet group just west of Snake river by McLain, Venberg, Tuftager, and Alberg. Bedrock is only 12 ft. below the surface.

ARIZONA.

COCHISE COUNTY.

A new road has been completed from Cabullona station on the Nacozari railroad to the Santa Rosa mine, 15 miles south of Douglas. New hoisting machinery has been ordered, and the property is looking well.

During the past week, good ore has been struck in the Irish Mag workings of the Calumet & Arizona, on the 950-ft. south level. The ore is said to run between 8 and 15% in copper.—At the Oliver, the new electric pump is about ready to start. It will have a capacity of 600 gal. per min. at a depth of 1,200 ft.——The bids are all in for the erection of the Shattuck & Arizona smelter. At the mine, the drift on the 900 level, at 75 ft., ran into a body of sulphide ore, which ran about 4% The payroll contains 225 names, and about 300 tons of ore are shipped daily.——At the Hoatson shaft of the Superior & Pittsburg, the work of cutting the station on the 1,200 level is progressing rapidly. A station is being cut on the same level in the Junction, where a relay pumping-plant will be installed.

MARICOPA COUNTY.

In the Cave creek district there is a good deal of activity. The Grand Traverse & Arizona company has a shaft down 60 ft. and a contract has been let for 100 ft. more. On another claim it has a 325-ft. shaft, with some copper showing. C. F. Smurthwaite is the superintendent. This company is composed of Michigan people.——The Kentucky-Arizona company is developing its ground, and has a good equipment. R. T. McCullough is its representative.——A shaft is down 500 ft. on the Mormon Girl mine, and drifts have encountered ore, but work has been suspended for two months.

MOHAVE COUNTY.

Regular shipments of copper ore are being made by the St. Charles Brothers, from the Midnight mine to the Humboldt smelter.——Work is progressing on the Nonpareil and other claims near the old McCracken mines.——The Gem and Vanderbilt mills at Cerbat are running steadily, producing bullion and concentrate. Some shipping ore is produced by these mines.——The Berkeley mill is running and producing a good grade of concentrate. As soon as the mine has been pumped out, a better grade of ore will be stoped. ——W. H. Corbier has a bond and lease on the Kemple mines, in the Weaver district. Shafts will be started at once.——A large flow of water has been encountered in the shaft being sunk on the Pleades mine, at Cerbat. J. T. Davis is in charge of the work.——W. A. Mensch has arrived at Kingman, and will start the development of mines in the Enterprise camp, especially the Le Roi Copper Co.'s property, adjoining the Enterprise.——The officers of the Benedictine M. & M. Co. have recently visited the company's property, which is the Arnold group of claims. Sinking will be resumed at once.——Engineers are examining the old McCracken mine, west of Signal, for Chicago people.——The Onita mines, north of Williams, owned by the Tawa Developing Co., have been leased to the Humboldt smelter people. This company is also operating the mines east of Hackberry, under bond from Tomlinson & Brown. ——Some good ore has been found on the 300-ft. level in the Catherine mine of the Pyramid group. A cross-cut is being run on the 400 level to cut the same orebody. Lewis Hofer is the superintendent.——Newton Evans reports the sale of the Signal Copper Co.'s holdings in the Bill Williams Fork region, to New York people.——The Expansion Mining Co. has its compressor in operation and is making good progress with machine-drills in the big tunnel.——As soon as the Cupel mine is unwatered the shaft will be sunk by the Stockton Hill Mining Co.——It is reported that Epps Randolph has taken a bond on 25 copper claims in the Cababi district.

PINAL COUNTY.

The capacity of the Big Lead mill near Kelvin will be increased from 50 to 150 tons per day. Both the Big Lead and the Kelvin reduction mills are running to full capacity and shipping concentrate to El Paso. The Big Lead and Calumet companies have consolidated and the new company will be known as the Kelvin Calumet Copper Co. W. E. Sharps is the manager for the Big Lead company. ——The narrow-gauge railroad from Kelvin to Ray is nearly finished, and the 200-ton concentrator being built at Kelvin by the Ray Copper Co., will be running within 60 days.——The Arizona-Hercules Copper Co., headed by W. P. Dunham, is doing extensive development work.

YUMA COUNTY.

The camp of Salome is lively. The Harqua Hala now has 20 stamps working on ore from the Golden Eagle claim, and has completed a tramway from this claim to the Harqua Hala. The company employs 75 men, and 20 stamps will be added to the mill.—— The South Cholla Development Co., backed by Chicago and Los Angeles people, is putting down a 500-ft. three-compartment shaft. A new air-compressor will be installed within a month.—— Los Angeles people have purchased the White Steamer claims, the Big Four, and others in the same belt.—— The Putnam & Dresser property has a shaft down 350 ft.—— West of Salome, the Ironwood & Arizona company employs 15 men, and has a shaft down 260 ft.—— On the old Bullard property, in Cunningham pass, 30 men are at work, and a carload of ore per week is shipped.—— The Copper Whale group of claims has been sold to New York people and work has started.——At the Ora Cobre, joining the Copper Whale, the shaft is down 240 ft. and shows ore in the bottom.——At the Clara, or Carrigan property, a contract has been let for 100 ft. of work on the vertical shaft.

CALIFORNIA.

AMADOR COUNTY.

The old Treadwell mine is being opened by the Sutter Creek G. M. Co. This property, which is situated on Sutter creek, near Volcano, once produced rich ore, but the vein pinched out. A new cross-cut is being driven, under the supervision of John Hall, some milling ore has been encountered, and the five-stamp mill will be started.

CALAVERAS COUNTY.

About 300 men are working at the Goatranch mine at Keystone, operated by the Nassau Copper Co. At the 200-ft. level stoping is proceeding, and the ore is hauled to Angels.——The strike and lockout in the mines of Angels Camp still continue and there is no settlement in sight. Many miners have left the camp.

NEVADA COUNTY.

There is quite a revival of interest in mining in the Washington district, especially on Canyon creek. The Mountain View mine, managed by E. B. Miller, is again running, and the three-stamp mill is in operation.——Ed. S. Brindle is running a cross-cut on his claim near the Ethel, and expects to strike the vein in 50 ft. more.——Fred Marcotte has purchased the five-stamp mill that was ordered for the Isis mine, and will erect it on his property.——J. W. Morrell is developing properties in the vicinity of Forest and Alleghany.——A strike was recently made in the Thornburg property, and the Del Norte-Scotia claims have been bonded by Crafts & Smith to T. E. Jameson, of Alameda. ——The 20-stamp mill of the Champion company is running continuously, and 120 men are employed at this property on Deer creek. This company has started sinking the shaft in the Home mine, which is already down 800 ft.—— A rich orebody has been struck on the 260-ft. level of the California mine on Deadmans Flat, in the south drift. The vein is from 10 to 18 in. wide and looks permanent. This mine was worked years ago, and has but recently been reopened by Grass Valley men.——The Olla, or McPherran mine, is being developed under the direction of A. Spotswood. The tunnel is in 500 ft. and will have to go 700 ft. further to strike the vein, which will give 300 ft. of back. ——Henry Kaler has resigned as superintendent of the Gray Eagle mine at Maybert, and A. A. Charonnat is now in charge. Frank L. McPherson is foreman, and the mill has been started.

A new pumping plant has been ordered for the Kenosha Mining Co. There will be two Cornish pumps, with a capacity of 1,000 ft. in depth, driven by electricity, and a new electric hoist will be installed.——An important strike is reported on the Last Chance gravel mine, just beyond Canada hill. A bedrock tunnel was run 400 ft., a raise was run 60 ft., and the pay-streak of ore tapped. The property consists of 40 acres, and is owned by J. M. O'Hearn.

PLACER COUNTY.

Some good ore is being mined in the Rublin mine, near Last Chance.——The Alameda mine, in Sailor canyon, will be opened this summer.—— A. G. Head has let a contract for running a 150-ft. tunnel on the Dardanelles.—— G. Maloney is running a tunnel on an old quartz claim near Forest Hill.——The Rawhide company declared a 10% dividend this month.——L. C. Trent is running a cross-cut at Mineland, but has not yet reached the vein.——Much construction is going on at the Dairy Farm mine. A new compressor has been put in place and the new hoist is nearly finished. The shaft is down 600 ft. About 100 men will be employed.——The Northern California G. M. Co. is pushing work on the old Herman mine, also called the Barton. About 60 men are employed, and an addition of 30 stamps will be made to the old 15-stamp mill. The electrical equip-

ment is at Colfax, awaiting shipment to the mine. Next year, the company expects to add 60 more stamps, and sink to a depth of 1,500 ft. The parallel vein on the Schulz claim will also be developed. This company is composed largely of Pittsburg capitalists. Henry C. Carr is the superintendent.——The Washington quartz claim has been sold to L. A. Gross, for $10,000, and he will, in conjunction with E. W. McGraw, of San Francisco, tear down a 20-stamp mill in Amador county and erect it on this property. ——The Excelsior mine is being put in shape and the 10-stamp mill will be operated this summer.——The Trinidad mine, south of Cisco, will be worked this summer.—— The Lost Emigrant mine has been bonded, and a 10-stamp mill will be erected on the property.—— W. S. May will erect a 30-stamp mill for a Pittsburg company, 18 miles above Forest Hill. A 500-h.p. steam-plant will operate the mill and a 200-kw. generator and two air-compressors will be installed.

The Lost Emigrant mine near Summit will be opened as soon as the snow melts. W. H. Bray and associates will put up a 10-stamp mill.——There is a force of 50 men work

California.—Showing Position of the Counties.

ing at the Herman mine. Sites for the sawmill and quartz-mill are being prepared.——The new tunnel at the Eureka is through the rim, but has not reached the bed of the channel. ——The tunnel at the Hidden Treasure is being run through the reef, and is expected to open the old blue lead.——Work is progressing on the tunnel of the Rawhide.——More men will be put to work on the Golden Scepter mine, near New England Mills. F. Ephraim is in charge.——W. A. Freeman will run the Black Hawk tunnel 75 ft., to the channel. ——N. E. Davenport is developing a vein on the Lillibridge property.——Fred. W. Snyder has made a good strike on his property in Black cañon, above Forest hill. Sample shipments have been made to the smelter.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The strike reported last week in the Sydney adit of the East Argentine M. & M. Co. has proved better than at first supposed. There is a streak of lead ore three feet wide, with 50 ft. of mineralized quartz between walls, much of which is concentrating ore. The company owns a fine water-power and millsite and can erect a mill near the mouth of the adit which could be run at low cost. The cost of hauling the concentrate to Georgetown should not exceed $1 per ton. C. L. Cuist is the mine manager.——In cleaning out the upper workings of the Maud S. property, on Douglass Mtn., a good body of pay-ore was discovered on the hanging wall of the lode. The drift is now being pushed ahead on an eight-inch streak of ore. Shipments of ore from this property when previously worked returned 600 oz. silver per ton.——Shipments are being made from the Cashier on Douglass Mtn. to the Newton mill at Idaho Springs for concentration. The crude ore contains 19 oz. silver per ton with 40% lead and 34% zinc. L. G. Shepard of Georgetown has a lease and bond on the property.——C. W. Benkleman & Son of Denver have taken a lease and bond on the Nabob mine at Silver Creek. A drift is now being run on the Nabob lode to the east and a 12-in. vein of good silver-lead ore has been opened up.——The Prudential M. & T. Co., whose property is situated on Republican Mtn. with the portal of the Prudential adit within the town limits, is steadily driving the adit and will erect an air-compressor plant to operate machine-drills in this adit, and also its Montgomery Ward adit, situated about 1,000 ft. higher up the mountain, and being driven in the same direction as the Prudential, a little south of west, to cut the extension of the famous Pay Rock lode which has produced over $3,000,000 in the past. Wm. C. Hood is the manager.——Arrangements are being made for continuous shipments from the Santiago mine in East Argentine, over the Argentine Central R. R. Wm. Rogers, the manager, has made arrangements with the Waldorf Mining Co. for an electric-power line to the Santiago to enable him to operate electric drills. As there is ore blocked out in the mine, the output should average 25 tons per day.——The Silver Cloud on Sherman Mtn. is putting out ore which carries 35 oz. silver per ton. J. W. Olds, the manager, is sinking a winze on the ore-shoot from the Victoria tunnel-level.

Georgetown, June 21.

TELLER COUNTY.

(Special Correspondence).—Thos. Kavanaugh & Co. has a lease on the Wild Horse mine, on Bull hill, and is handling 800 tons through the cyanide plant. They are taking high-grade material from the lower levels, which is being shipped direct to the Golden Cycle mill at Colorado Springs. The mill at the mine is not equipped for handling this high-grade material, and it would not pay to remodel the mill for the amount they are taking out. The mill is dry-crushing, and the ore requires wet-crushing machinery. The mill has been operated at a profit on the ore which they are able to handle. A number of sub-lessees are taking out ore on the Wild Horse.—— The W. P. H. M. & L. Co. is operating a lease on the west end of the W. P. H. claim. The shaft is down 350 ft., and over 2,000 ft. of drifts are open. A. B. Whitmore, the superintendent, states they have a body of oxidized ore, that runs $6 to $9, that is over 200 ft. wide. The company is erecting a 100-ton mill for handling the ore from this mine, as well as working the dumps of the Jerry Johnson mine, on which they have a lease. The mill is being constructed by Groch & Woodard, consulting engineers, of Cripple Creek. They have been delayed on account of deliveries of material, but hope to be running before August 1. The company has 15 acres in the lease.——The Jerry Johnson expects to declare a dividend of one cent shortly. This company owns 41 acres on Iron Clad hill and is free from debt, and when a dividend is declared they reserve $10,000 in the treasury.——The Isabella mill, of which Geo. D. Kilbourn is the manager, is understood to be a success financially. This mill is handling some of the ore from the Isabella mine, but a majority from the dumps.——The Phœnix Leasing Co. is handling 100 to 150 tons per day through the Homestake mill, mostly custom ore. The mill has a daily capacity of 800 tons. John A. Johnson, the manager, believes they will soon be running full capacity. But three men are employed to do the work in the mill. Everything is automatic and handled by machinery. They turned out a brick a few days ago from four days' run weighing 140 oz. This mill has been operated at different times, but did not seem to be a success; but the present management feels much encouraged over the outlook.

Cripple Creek, June 19

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The Nevada Hills Co. has announced that the usual quarterly dividend of 10c. per share, or $75,000, will be paid this month. This makes a total of $225,000 in dividends for this year-old mine. A good strike has been made 660 ft. east of the developed portion of the mine, the ore running $100 per ton. In the older workings excellent ore is being extracted. The transportation problem is greatly hindering the shipments.——A strike has been made on the Golden Boulder, samples of the quartz running several hundred dollars per ton.—— Excellent ore is being taken from the Paymaster No. 4 claim of the Fairview Red Rock Extension. The ore runs about $50 per ton.——Good ore is being taken from the Knox lease, some of the ore assaying $500 per ton.—— Driving is in progress on the 75-ft. level of the Crosscut claim on the Red Rock. In the main shaft, good ore has been found. The surface and hoisting plant has been shipped, and is expected to arrive in a few days.

Fairview, June 14.

ELKO COUNTY.

(Special Correspondence).—The Tuscarora-Nevada Mines Co., capitalized at $12,000,000, has absorbed the following properties: Commonwealth, Grand Prix, Navajo, Independence, Queen, Dexter, De Freeze, and North Belle Isle. These mines have a production record of approximately $40,000,000, and have paid over $13,000,000 in dividends. The properties contain quartz veins and placer ground. The deepest shaft is down 700 ft. The company will sink several shafts to operate the mines at depth, while dredges will be used to work the placers. It is negotiating for several other properties, and a bright future seems to be in store for this famous old camp.

Tuscarora, June 22.

ESMERALDA COUNTY.

(Special Correspondence).—The Little Florence Co. has received $103,528 from the smelter for seven shipments of ore from the Red King claim of the Florence mine. The average value was $345 per ton and cost $35 per ton to ship and treat the ore. It is reported that the company will soon pay a dividend of 10c. per share, or a total dividend of $100,000.—During the past week 1,548 tons of ore were shipped from the Little Florence, Consolidated, Jumbo Extension, and Quartzite mines. Of this amount, over 900 tons were produced by the Consolidated mines.——On the Wedge Fraction claim of the Jumbo Extension four leasing companies are operating: Mohawk-Jumbo, Curtis, Higginson, and Mohawk Ledge. The claim is north of the Mohawk mine.——The Kalfus and Ish & Sheets leases, which were recently released from litigation, are preparing to resume operations. The Kalfus is regarded as the most promising lease in the entire camp.——The rumor that the Consolidated and Jumbo Extension were likely to be involved in litigation is denied by officers of both companies. Low-grade ore is being blocked out in the Gold Bar, and will be held until it can be handled at local mills. From the C. O. D. good ore is being extracted, and the lease of the working company will soon expire. It is not known whether the lease will be extended, or the mine operated by the owners, but it is understood that the lessees are desirous of continuing operations.——Some of the richest ore in the camp is being taken from the McNaughton lease on the Mohawk.——It is estimated that Goldfield has a population of 35,000. Rents are exorbitant and an adequate water supply continues to be an important problem.

Goldfield, June 23.

HUMBOLDT COUNTY.

(Special Correspondence).—The Tomboy property has passed into the hands of C. D. Bridges, of Memphis, and the plan is to operate the mine on a large scale. The Tomboy adjoins the Mazuma Hills, Vernon Fraction, Thor & Lizzie, and other properties.—— The shaft on the Fairview claim of the Seven Troughs group is down 359 ft. and will be sunk to a depth of 500 ft. On the Vernon claim the shaft is 60 ft. deep, and a cross-cut is being driven to reach the vein that was cut by the shaft.—— A 12-ft. vein has been struck in the 175-ft. tunnel on the Golden Treasure.—— At the Moler Buckhorn, the incline shaft is down 135 ft., and a 20-in. shoot of ore has been found. About 500 ft. west of the incline shaft, a vertical shaft is being sunk that will be the main working shaft.—— Several lessees are working on the Climax, and excellent ore is being extracted.——Good ore has been struck in the Silver Peak, and the vertical shaft is down 68 ft.——Two feet of quartz has been discovered in the Mazuma Hills, and some high-grade ore is ready for shipment. The mine is operated chiefly by lessees.——A tunnel is being driven on the Kindergarten Extension and will be run 400 ft. The mine is in the heart of the district.—— At the Kindergarten, three cars of ore are ready for shipment, and more is being extracted.—— Ore has been encountered in the Thor & Lizzie, and a new hoist is being installed. The shaft will be sunk to a depth of 300 ft.—— The Dingee Fraction company has refused an offer of $30,000 for the claim. The property contains less than six acres. Development work is under way and the claim is showing well. ——At the Badgers, owned by the Fine Gold Co., ore has been found, and shipments will soon be made.——Good ore is reported from the Eclipse, and it is thought the Mazuma Hill vein passes through the property.—— The shaft at the Tigers will be sunk 300 ft. Some good ore has been found. ——Truett & Monnette have installed a gasoline hoist on their lease on the Seven Troughs holdings, and will sink a shaft to a depth of 300 feet.

Vernon, June 20.

LANDER COUNTY.

(Special Correspondence).—Hodson & Colbath, of Salt Lake City, have purchased the Grand Victor group of four claims from Montgomery & Katterborn, for $30,000. The property adjoins the Gold Quartz mine, and contains an extension of the Biggs vein.—— The Uncle Sam group of four claims has been sold to Fred E. Bowman, of Denver, for $10,000. The claims adjoin the Bridal Wreath property. ——A short option on the Bridal Wreath has been granted to E. W. Smith and associates of Salt Lake.—— The Atlantic-Nevada Mines Co. has secured the Greyhound and Truckee properties. A shaft will be sunk to strike the Gold Quartz and Little Gem veins, which pass through the claims.——The shaft on the Phœnix is down 125 ft. from the surface, or 25 ft. below the tunnel level. The new hoist has been installed.—— A new hoist has been erected at the Gold Quartz shaft, and some good ore is being extracted. —The Little Gem is shipping 40 tons of ore per week, and much prospecting and development work is being done. A gasoline hoist, air-compressor, and pumping plant were recently installed.—— Good ore was recently encountered in the St. Lawrence and Anaconda claims, operated by the Lander-Tenabo Co. The vein parallels the Phœnix vein, but is gold, while the Phœnix vein carries silver and copper.——The shaft on the Two Widows is down 110 ft., with some high-grade copper ore in sight.—— A tunnel on the Dutch Oven property has opened up a vein of gold and copper ore.

Lander, June 21.

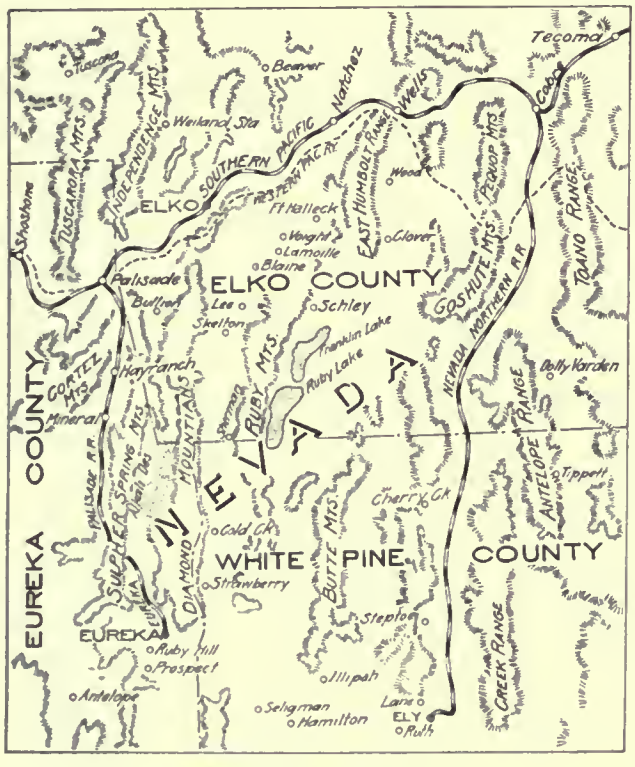
LINCOLN COUNTY.

(Special Correspondence).—Good ore has been discovered on the Spokane claim of the Searchlight Spokane Mining Co. This property was worked for a long time by the Southern Nevada M. & M. Co. The rich streak, which is six inches wide, was uncovered by A. F. Jennings, who has been in charge of the property. From El Dorado Canyon comes the news of a strike on the Black Hawk claim of the El Dorado Empire Mining Co. At a depth of 85 ft. in the east drift a body of ore has been encountered, the entire drift being in ore. At Nob Hill the Silver Legion, which has been operating but three weeks, since resuming in its shallow workings, has encountered an 18-in. streak of silver-gold ore running well. To date 50 tons of this rock has been sacked. The find was made on the 85-ft. level in the east drift.——Adjoining these properties the El Dorado Sphinx is opening up a body of milling ore, and has a two-foot streak of shipping rock.——A concentrating plant may be built on the Spinx. Water has been developed on a millsite on the Sphinx claim, within 100 yd. of the tunnel, and the mill will be built there.

Searchlight, June 20.

NYE COUNTY.

The annual meeting of the shareholders of the Tonopah Extension Mining Co. was held in Pittsburg May 20. The report shows that during the year ending in May, 4,637 ft. of development work was done, making a total of 14,250 ft. of development work. During the year the shaft was sunk from the 601-ft. point to the 972-ft. point, and 13,945 tons of ore were shipped to the smelter, giving a net return of $345,078. On account of the intrusion of dacite, 200 ft. thick, cutting through the vein below the 600-ft. level, shipments were curtailed, and the shaft is being sunk to the 1,050-ft. level, when cross-cutting will be started about the first of next year.——Shipments of ore from Tonopah during the week ending June 15, as reported from the Western Ore Purchasing Co., and the Tonopah Mining Co., amounted to 6,153 tons, divided as follows: To smelters, Tonopah Mining Co., 1,242 tons of ore; Belmont, 224; Extension, 220; Montana-Tonopah, 100; Midway, 37; Jim Butler, 30; West End, 40. To the mills: From the Tonopah mines, 3,190 and from the Belmont, 1,060 tons of ore.



Map of Eastern Nevada.

SOUTH DAKOTA.

LAWRENCE COUNTY.

(Special Correspondence). — The strike in Lawrence county, which affected all the mines in the northern hills except the Homestake, was settled on June 7 and the miners have resumed work. This strike commenced on January 1 and ran five months. The settlement was a compromise between the miners' union and the mine owners, and by the agreement just signed the men go to work for $3.20 for eight hours, and this agreement is to run for three months, when the old-time wages ($3.50) will be paid for an eight-hour day. The leading mines which were affected and which have now resumed work are the Mogul, Golden Reward, North Homestake (Maitland), Gilt Edge Maid, Golden Crest, Branch Mint, Wasp No. 2, and the Lundburg, Dorr, & Wilson, all of which employed about 700 men. The Homestake mine, which caught fire on March 25 and burned for a month, started flooding on April 22 and the fire was extinguished May 29, when the work of unwatering commenced. At present 600 stamps are dropping on ore taken from the large open-cuts, and from the upper levels of the mine, the deepest workings of which are 1,550 ft. There is said to be 100 miles of drifts, tunnels and shafts in the underground workings of the mine.——The resumption of work at all these mines has given quite a cheerful aspect to the towns of Lead and Deadwood, which for some weeks have been quite dull.—— In the central hills work is progressing on the Golden West and Montezuma at Rochford, and the Auburn mine at Mystic, besides a score of mines which are undergoing development.—— The Clara Belle Mining Co., near Oreville, in Pennington county, has not struck the rich pay shoot that they were sinking for, and which they left in the bottom of their old incline, although they have drifted about 500 ft. on the 250-ft. level, or the bottom of the new working shaft. They have encountered a good deal of low-grade ore in the drifts, but the vein they are running for goes $24 per ton in gold and is about seven feet wide, and they will probably strike it soon. The superintendent is Frank Hebert.—— The Holy Terror Keystone is about to be unwatered, and the main shaft, which is now 1,200 ft. deep, will be sunk. This mine has been a rich producer in the past, but has been tied up for years on account of litigation, which happily is now at an end. The mine has been leased to a company of which Chas. Morgan is president, R. H. McNulty superintendent, and E. A. H. Tays consulting engineer. The company announces its intention of putting up a mill of 100 stamps during the coming summer, but this announcement is considered premature. They have a good 20-stamp mill already.—— It has also been announced that John Truax and Gustave Mueller will commence work in a few days on their wolfram mines, which has an excellent showing of that mineral. ——The Black Metals Mining Co., of Hill City, is advertising that it is in the market to buy tungsten ores.

Custer, June 15.

WASHINGTON.

CHELAN COUNTY.

Developments on Chelan butte have increased the excitement at Chelan, west of Spokane. Kingman & Pershall claim is proving rich. The main vein is four feet wide carrying free gold, and through the centre runs a four-inch vein that goes high. Mr. Pershall has cross-cut the vein for 120 ft. So far, however, they have gone down only 18 ft. Other claims on the butte are showing up extremely well. S. Fourtner's original claim, the Jumbo, has produced ore said to be richer than that of the Kingman & Pershall claim, although the latter, so far, shows the best defined lode.

FERRY COUNTY.

(Special Correspondence).—A silver and copper-bearing vein on the Leonore group of five claims, on Manilla creek, has been opened by a 40-ft. shaft and about 700 ft. of tunneling. It is 28 ft. wide in the lower adit.—— The Central Mining Co. has spent over $16,000 in development of the Umatilla group of claims, and recently struck ore in the lower adit similar to that found in the upper workings.

Republic, June 22.

STEVENS COUNTY.

Shipments have been resumed from the property of the United Copper Mining Co., near Chewelah. The ore, which will be sent out at the rate of 15 tons per day, will be taken from the shaft until such time as the lower tunnel cuts the orebody.——Strikes of ore made recently on the Bella May claims in the Metaline district, north of Spokane, seem to establish the continuity of lead-silver orebodies in that part of northeastern Washington. Samples from No. 2 tunnel show 10% lead. Work has been suspended on the tunnel and a cross-cut begun. This will be run to tap the hanging wall on No. 3 level, after which a drift will be run to get under the drift on level No. 2. No. 3 tunnel will give a depth of 202 ft. below No. 2, and a depth of 282 ft. vertically from the surface. The Bella May claim is one of the properties of the Spokane Lead Mines Co., of which D. D. Birks is president.——W. W. Warner, general manager of the Sterling Silver-Lead Co. of Spokane, announces that the company has made application for the survey and patenting of several more of its claims, covering 300 acres. The company now owns 600 acres of mining claims in the district, and nearly half the shore-line on the Pend d'Oreille river. He reports the camp is lively with extensive development in progress on many of the properties.—— L. Bryant of Spokane has organized the Superior Copper Mining Co., which will develop the old Bay State mine, near Brown's lake, west of Chewelah

Special Correspondence.

London.

The Future of Esperanza.—Other Mexican Mines.—Camp Bird.—Tin Mining in Tasmania.—Resignations from the Institution.

A conviction appears to have taken root in the minds of dealers in the American mining market that the rich ore has failed, or will soon fail, with increasing depth in the Esperanza mine. This view does not find expression in the public utterances of the Company's officials. At the fourth general meeting of the shareholders held this week, referring to the developments, the Chairman pointed out that the north ends of the 6th and 6th intermediate levels continued to open up rich ore in the heart of the mine. How far and how deep this rich ore went in that locality future developments could alone determine; but the Chairman thought the bona-fide shareholder who refused to give the mine some credit for such a prospect as this bonanza shoot still offered must indeed be a pusillanimous person. He went on to say that the future of the mine probably depended chiefly, though not entirely, on the developments at depth. With regard to such prospects, he had already referred to the very satisfactory position of the deepest levels on the north end of the sixth level. In addition to this, as pointed out in the report, the evidence of their neighbors, as far as it went, was extremely promising. On the 1,000-ft. level of the El Oro mine a considerable length of ore had been found of substantial width and high value, establishing beyond any question of doubt that good ore was to be found in depth in this district. The 6th level, which was practically their deepest working in ore, was 400 ft. above this last strike of rich ore in the El Oro. The Mexico mine, on the other side, was also opening up rich ore, while their own developments in that neighborhood continued to be of a most satisfactory character. Looking to the whole situation, he had no hesitation in saying that in his opinion, the prospects of the Esperanza, which had shown itself to be one of the great gold mines of the world, continued to be bright and promising, and while they could not say what the gods might have in store for them, no impartial critic could deny that the possibilities of the mine at depth might yet exceed the most sanguine expectations. As voicing the desire of the London market for more light, a prominent stockbroker suggested that a small committee of prominent shareholders should be appointed, with an independent engineer, to report to the shareholders the exact position of the mine at the present time. This proposal was not adopted. Esperanza profit for the month of April is reported as $93,988.

The report for April from the El Oro states that the No. 1 100-stamp mill ran 28 days, the No. 2 100-stamp mill ran 29 days, and together crushed 21,524 tons of ore. The total estimated realizable value of the products is $190,631. Less working expenses, $101,899; less development expenses, $11,690; making $113,589 ($5.28 per ton), or a profit of $77,042. Profit from the railway for the month, $9,522. Total profit, $86,564. The sum of $15,801 was expended during the month on permanent improvements. During May the Mexico mine shipped 585 tons of ore, of an estimated value of $97 gold and 60 to 65 oz. silver per ton. Net proceeds, $62,500. Dolores profit for April is returned as $21,000 from a total production valued at $49,000.

Camp Bird has declared a final dividend of sixpence per share, free from income tax, payable June 26, making a total distribution of 12½% for the year ended April 30, 1907. During April the mill ran 28 days and crushed 6,125 tons of ore (dry weight), yielding 8,648 oz. bullion and 591 tons of concentrate. Amounts received from sales of product effected during the month: Bullion (including cyanide bullion), $152,123; concentrate (531 tons), $34,910; total, $187,033; expenses (including development, transportation, and treatment of product), $48,062; profit at mine, $138,971. Feet of development work, 570. The report winds up with the oft-repeated tantalizing remark that it must be borne in mind that the sales do not necessarily relate to the month's production, although some portion is included. Having regard to the sharp fall in price, it might be thought that as in the case of Esperanza, quoted above, doubts were prevalent as to the future of Camp Bird. It is more likely, however, to have been occasioned by the semi-panic conditions of the market as a whole. In such times holders are compelled to sell anything that will bring in money at short notice. On the other hand, Camp Bird would undoubtedly be more in favor with dealers if a monthly or even a quarterly statement of profit could be made, instead of a report of sales and expenses. At the same time it must be admitted that 12½% corresponds merely to a fair return on par in the case of a mining share of this description, as any prudent investor would consider that he should regard a large proportion of such a dividend in the light of a return of capital as a provision against exhaustion of mineral area. Of course such a basis for calculation is not applicable in the case of many mines (it might be said the majority of mines) that are less favorably situated than Camp Bird with regard to reserves of ore and future possibilities.

Briseis Tin Mines Ltd. (operating in Tasmania) has issued a satisfactory report for 1906 and shows good prospects for the immediate future. The proceeds of tin sold, with the tin in transit and on hand at December 31, since realized, amount to a total of £168,122, while expenditure at the mine was £30,162 and administration expenses in the colony, £1,733. The sum realized for the tin exceeds last year's figures by £72,000, though the mine expenses (including administration) are only increased by £2,500. The net profit for the year amounts to £128,557. The dividend and bonus for the year are equal to 37½% on the Company's capital, after payment of which a balance of £42,235 is carried forward. The total quantity of black tin produced was 1,408 tons of an average fineness of 75.3% metal. During the year under review 519,000 cu. yd. overburden were removed, as against 551,000 in the previous year, and the drift sluiced amounted to 616,000 cu. yd., as against 481,000, while the average yield from the latter works out with remarkable similarity, namely 5.68 lb. per cu. yd., as against 5.91 last year. The following details of the costs are of general interest and they indicate the nature of the operations:

	Tin ore won. £ per ton.	Metallic tin. £ per ton.
1. Sluicing	1.408	1.920
2. Hydraulicking, cleaning reef, breaking and stacking granite boulders, cement, and fallen basalt	3.448	4.703
3. Extending pipes and races in face, erecting elevators, maintenance	0.528	0.720
4. Cleaning-up, dressing, weighing, and bagging	0.661	0.902
5. Blacksmithing, blasting, and miscellaneous	0.452	0.616
6. Electric light	0.361	0.493
7. Head and tail races, maintenance, and repairs	0.863	1.177
8. General stores, timber, and explosives	0.535	0.730
9. Moving and repairs to main columns, salaries, office, and other general expenses	1.973	2.690
Total	10.229	13.951

The curiosity of the public has been aroused by the

announcement just made that C. Algernon Moreing and Herbert C. Hoover, partners in the firm of Bewick, Moreing & Co., have resigned from membership of the Institution of Mining & Metallurgy, and that W. J. Loring, J. A. Agnew, J. T. Hollow, and C. S. Herzig, members of the staff of Bewick, Moreing & Co., have also resigned. According to *The Daily Mail*, the many who are interested in the firm and the institution will scarcely be satisfied with that bald announcement, which will doubtless be followed by more information.

Morenci, Arizona.

Prosperity at Clifton and Morenci.—Raise in Wages.—New England Copper Co.—New Plant of Detroit Co.—Disposal of Tailing.—Ore Discovered in Limestone Quarry.

The two attempts of the Western Federation of Miners to organize unions in this place and Clifton have proved decided failures, practically no interest being displayed in the meetings by the employees of the operating companies in the Clifton-Morenci and Greenlee mining districts. These districts are now enjoying the greatest prosperity known in their history. A general raise in the scale of wages has been made. This is supposed to be because of the increased production and the prevailing high price of copper. The smelter of the Shannon Copper Co. at Clifton is handling ore from four or five of the minor companies in the district, among which are the Gold Belt D. & R. Co., and the Molder Mining Co. The Detroit Copper Mining Co. is treating ore from the Standard Copper Co.'s mines above Metcalf. The old company, known as the Home Copper Co. has been reorganized as the New York-Arizona Copper Co., with H. J. Degenar, president, and J. F. Cleaveland, vice-president, and a small number of shares have been placed on the market to raise funds for the further development of the property.

The New England Copper Co., whose mines are situated about four miles above Clifton, on the San Francisco river, is building a narrow-gauge railroad to connect with its property and the A. & N. M. Ry., by which their ore can be taken to the Shannon smelter. The Minneapolis Steel & Machinery Co. has just completed a large steel structure for the Detroit Copper Mining Co., which will be occupied by the converting plant. The structure is built just below the furnaces, and the converter-shells, of which there are three always in operation, can be charged from the furnaces through launders. A 40-ton electric crane, with a 10-ton auxiliary crane, manufactured by the Morgan Engineering Co., of Alliance, Ohio, has been installed to handle the matte and heavy machinery. The dimensions of the converter building are 60 by 180 ft., with an annex 40 by 150 ft. The floor-level of the annex is 10 ft. lower than that of the converter-building floor, and after the copper is poured into the molds and cooled, it is dumped through openings in the floor to a lower floor, where it is chipped, weighed, and run onto the Morenci Southern cars. The Minneapolis Steel & Machinery Co. has just completed the steel framework of the new machine-shop, dimensions 80 by 160 ft., for the Detroit Copper Mining Co. This company is also putting up some buildings for the Shannon Copper Co., at Clifton. The concrete tank for the mill-tailing of the Arizona Copper Co. at the bottom of their new No. 6 concentrator, is proving a success. The large tank is divided into four compartments. When one or two compartments are full of the drying tailing, other compartments are being filled with wet tailing, while still others are being emptied. In the centre of the tank is a large revolving crane with a double-jawed bucket which lifts the dry tailing and deposits it in bins, from which it is hoisted by cars operating on an incline, to trains above, and hauled to the Humboldt, Clay, and Longfellow mines to be used as stope-filling. This same company is building a large rock and concrete impounding tank and dam in Concentrator canyon, below its No. 5 concentrator. These efforts toward the solution of the tailing question are the direct result of the litigation recently instituted by the farmers of the Gila valley, into which the tailing flows. Recently, while getting rock from its limestone-quarry, the Detroit Co. cut into a wide vein of ore which assays over 10% copper. Development was commenced at once and the vein is improving with depth. This find is only a few hundred yards from the company smelter, on the same level, and in the middle of the limestone-quarry from which this company has been getting rock for the past five or six years.

Salt Lake, Utah.

Shipments From Park City.—Silver King Consolidation.—Ontario Drainage.—Freight Rates.—Output of Tintic.

The ore shipments from Park City last week amounted to a little more than 1,100 tons, the contributing mines and amounts being: Daly, 50; Silver King, 737; Daly

Map of Arizona.

West, 491; Ontario, 38; Daly Judge, 480; Little Bell, 72; other mines, 78 tons.——The articles of incorporation of the Silver King Coalition Mines Co. have been filed with the proper State and County officials. The capital stock is 1,250,000 shares of $5 each and former Senator Kearns is given as general manager. This corporation takes over the business of the Silver King, Keith Kearns, Pinyon Ridge, and other Park City mining companies. While F. Augustus Heinze does not appear as a director, it is understood that he will soon be given a place upon the board. The State of Utah received a fee of $1,570 for the filing of the articles.——The drainage of the Ontario mine at Park City by means of pumps has been undertaken. Three sinking pumps, with a combined capacity of 1,500 gal. per min. have been installed at shaft No. 3. The water is to be lifted to tunnel No. 1, and thence run off through a drift to shaft No. 2, where it will be dropped to the drainage adit.——G. W. Lambourne, manager for the Daly Judge Mining Co. at Park City,

states that preliminary steps are being taken toward the erection of a plant for the treatment of zinc ore. The Daly Judge mine contains a large tonnage of such ore.

The Tintic Mine Owners' Association has obtained reduced freight rates on ore shipped to the Salt Lake valley smelters. The question was taken up with the transportation companies over a year ago. Hereafter the net value of the ore will be the basis on which charges will be made. On July 1, on ore netting $5 per ton the freight rate will be $1.10; ore of the net value of over $5 and under $10, $1.25 per ton; ore of the net value of over $10 and under $15, $1.75 per ton; ore of the net value of over $15 and under $20, $2.25; ore netting over $50 per ton, $3 per ton.——The State Board of Equalization has made a ruling requiring lessees in mines to pay a bullion tax in accordance with a law passed at the last session of the legislature. Lessees operating in the Tintic district have signified their intention of employing attorneys with a view to testing the constitutionality of the law.

The ore shipments from the Tintic district last week amounted to 151 carloads, the contributing mines and amounts being: Ajax, 4; Beck Tunnel, 9; Bullion Beck, 3; Carisa, 7; Colorado, 6; Centennial Eureka, 44; De Pue, 4; Eureka Hill, 9; Graud Central, 3; Gemini, 5; Lower Mammoth, 9; La Clede, 2; May Day, 5; Mammoth, 20; Scranton, 6; Tiutic Iron, 5; Uncle Sam, 4; Victoria, 1; Yankee Con., 5 carloads.——Two sections of the Utah Copper Co.'s Garfield milling plant are in commission and the third will be put into service about July 1.

Toronto, Canada.

Bush Fires in Ontario.—Larder Lake.—Shipments From Cobalt.—News of Development.—The Nipissing.

During the last few days northern Ontario has suffered greatly from the ravages of bush fires which have done damage to the mining districts, especially in the townships of James, Smyth, and Tudhope in the Montreal River district, and the neighboring portion of the Temagami Forest Reserve. Many prospectors have lost everything and narrowly escaped with their lives. The two camps of the Munroe-Saville company, and the Brien-Mahon, Harbeck, and May camps were destroyed, with large quantities of supplies, and the fires have destroyed so many stakes that it will be difficult to identify claims. The destruction of so much timber will make prospecting easier. Reports were current of loss of life, but the Department of Mines states that there is no reason to believe that any actual fatalities have occurred. The loss of timber is roughly estimated at $1,000,000. The camp buildings of the Green-Meehan mine narrowly escaped destruction, and were only saved by great exertions.

W. A. Campbell, Deputy Commissioner of Public Works, has returned to Toronto from Larder lake, where he has been engaged in laying out a wagon-road from Boston station on the Temagami & Northern Ontario Railway, to Larder City, a distance of 20 miles. The only roads so far are mere forest trails, and packing freight into the camp costs $100 per ton. It is hoped to have the road finished before the close of summer. Mr. Campbell states that there are about 4,000 people in the district.

Ore shipments from Cobalt for the week ending June 15 amounted to 204 tons from the following mines: Coniagas, 139 tons; Nipissing, 28; Right of Way, 36 tons of ore.

A meeting of the shareholders of the Foster-Cobalt Co. has been called for the 27th to consider the future course of development, and to sanction a by-law for the sale of treasury stock. The president, J. G. Kent, has issued a report to the effect that development and preparatory work has consumed all the funds. Less than one-fourth of the property has been partially explored, and the extreme depth reached is 75 ft., and deeper sinking and cross-cutting to cut veins not driven upon, are recommended by the engineers at an expense of about $10,000 monthly. To raise the money it is proposed to sell $100,000 of treasury stock.

Butte, Montana.

Reports of Mining Companies.—Interesting Figures.—Ida-Montana Assays.—Butte & Milwaukee.—The Green-Campbell Fiasco.

The completed reports of Butte mining companies for the year ending May 31, 1907, show the total net earnings of all mines to have been $20,263,291, against $17,489,695 for the year previous, an increase of $2,773,596. The complete statements show the following net earnings for 1907:

Boston & Montana	$7,049,988	North Butte	$3,271,214
Anaconda	5,819,184	Butte Coalition	1,432,760
Butte & Boston	1,249,467	Clark's Original	663,259
Parrot	147,731	La France	151,012
Trenton	481,624	Monida Trust	3,052

These figures are furnished to the Assessor of Silver Bow county, for purposes of taxation, and there has always been much questioning and doubt in the public mind as to the accuracy and value of them, the general opinion of corporations being such that the companies are not given credit for exactness in these matters. It is a notorious fact that some of the mining companies never make their reports until others have done so, and then report net earnings at about the same ratio to those of the other companies as in former years. It is also a fact that other companies, although the facts and figures were at hand in Butte, could not make their reports until they received instructions from the East, all of which has added to the public doubt as to the accuracy of the net earnings statements. One company for years annually reported its net earnings at exactly $600,000. The interesting portion of these annual reports is that relating to comparative yields per ton of ore, costs of mining, and reduction per ton. Some of these comparisons follow:

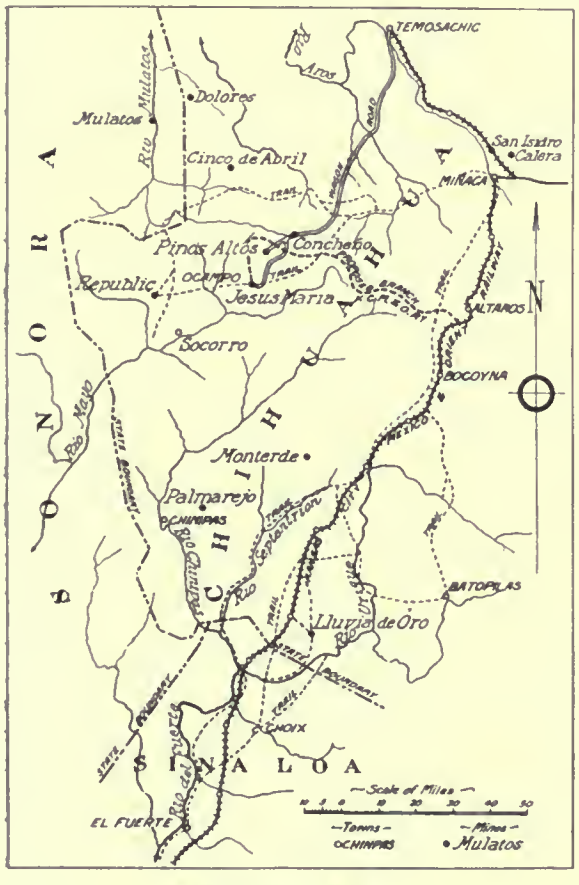
Company.	Gross yield.	Cost of mining.	Cost of reduction.
Boston & Montana	$14.37	$3.93	$2.67
Anaconda	12.23	4.47	2.52
Butte & Boston	10.89	3.79	2.28
Parrot	10.54	5.64	2.18
Trenton	9.96	3.64	2.21
Washoe	10.92	4.05	2.31
North Butte	17.47	4.53	4.00
Butte Coalition	11.55	5.49	2.29
Clark's Original	9.31	4.08	2.49
La France	14.18	6.35	3.19

W. D. Greenough, the manager of the Snowstorm Mining Co., says increased dividends will soon be paid. A number of important improvements are under way at the Snowstorm mine. The Northern Pacific railway is constructing additional side-tracks near the mine in order to be able to supply more cars for the transportation of ore. The mill is being enlarged, and three new leaching vats of much larger capacity than those now in use will be added to increase the capacity of the concentrator. The ore between 2 and 3% is being treated at the mill, while the higher grade stuff now being taken from the east drift on No. 3 level, running above 8% copper, is shipped direct to the smelters. A 300-h.p. compressor is being installed, and will be operated by water-power. A new 20-drill compressor has also been ordered. The cost of the improvements under way will be about $50,000.——It is reported that the Ida-Montana

Co. has struck six feet of chalcopyrite ore about 65 ft. southeast of the 250-ft. station. The ore-shoot is near the middle of a vein that has a width of 52 ft. The strike is considered important, as it is the first important orebody found so far east in that part of the district. The shaft of the company is down 330 ft., and another cross-cut will be made at the 400-ft. level.

The Coalition, North Butte, and Parrot have been doing an unusual amount of 'dead' work, such as exploration and development, all of which was taxed as cost of mining. The ore from the Anaconda, Butte & Boston, Parrot, Trenton, Washoe, North Butte, and a portion of that from the Coalition mines, is treated at the Washoe smelter of the Amalgamated Co. at Anaconda. The grade and character of the ore govern the cost of reduction. The North Butte sends more first-class ore to the smelter than any other company.

The Ida-Montana assay-returns from the vein cut on the 250-ft. level show 4.5% copper, 8 oz. silver, and $1.80 in gold per ton, while a small streak of the ore assays



Map of Part of Mexico.

17.6% copper. The shaft is nearly 400 ft. deep and another cross-cut will be run to the vein from the 400-ft. station.——The Butte & Milwaukee Copper Co. is making good progress in sinking the shaft of the Colonel Sellers mine. It is now down 400 ft. Orders have been placed for a new first-motion hoist and other machinery. The new engine will have a capacity to sink to 2,000 ft. The shaft on the Colonel Sellers was started last January. The cost of installing the surface plant was considerably increased owing to the cold weather at the time, but good progress has been made. The shaft is 4½ by 16 ft. in the clear, timbered with 12 by 12-in. timbers. The cost of sinking is now $63 per foot, which is said to be as low as the cost of any shaft of that size in Butte. It is going down at the rate of 90 ft. per month. The intention is to cross-cut the vein, which lies a short distance south of the shaft, at 700 feet.

At a meeting of the stockholders of the Green-Campbell Consolidated Gold Mining Co., held in Butte last week, it was voted to give a lease and bond on the property of the company to a new concern, known as the United Mining Co., for $210,000. If the option is taken up the money will just about pay the bonds and unsecured debts of the Green-Campbell Co., and the stockholders will have their beautifully printed certificates to show for their investments. The property of the Green-Campbell Co. is situated in the Silver Star district of Madison county. It is a big low-grade gold proposition, but there is no water within miles and an amateurish effort was made to run the mill with the water pumped from the mine, which proved a fizzle.

Mexico City.

The Oaxaca Smelting Co. and the Magdalena Smelter.—Stimulus to Local Mining.—A Fine Plant.—The Taviche District.—Sale of Rio Tinto Smelter.—Increase of Capacity.—To Treat Custom Ores.

At last the plant of the Oaxaca Smelting & Refining Co., near Oaxaca, State of Oaxaca, is completed, and a trial run has been made, but as yet not sufficient ore has been obtained to run at full blast. The building of this plant was started early last year, with T. J. Ryder, E. N. Brown, and J. B. Body as the prime leaders, and everything went along smoothly and rapidly until late in the fall, but when it was supposed the plant would be about ready to blow in, all work suddenly ceased, and so things remained up to within about two months ago. People in a position to know say that the leading spirits found that they had such a good thing they were not willing to take in with them some moneyed interests that were anxious to join them, and then when it was found that more money was needed than had been counted on, and the money interests were turned to they were not found so easy, having been left out when all was rosy, so work had to cease. However true this reason may be, it is true that the option held by the Oaxaca Smelting & Refining Co. on the smelter (known as the Magdalena, of 50 tons capacity), and mines of the Guadalupe & San Rafael Mining Co., which were the key to the lead situation of the district, at a price of 550,000 *pesos*, on which 20,000 *pesos* forfeit was paid, went by default, and Messrs. Williams and Hamer retained control of the Guadalupe and San Rafael, and have been adding to their holdings, while the Magdalena smelter has been running continuously for the past 12 months. It is believed, though, that some understanding has been reached between the Oaxaca S. & R. Co. and the Magdalena people (Messrs. Williams & Hamer), for otherwise it is doubtful if the Oaxaca plant would have been completed and blown in, as the Williams & Hamer properties are the only ones in the Oaxaca district producing any quantity of lead. If such an understanding has been reached, the deal cannot have been fully consummated as yet, for the Magdalena smelter is still in blast and, as stated above, the Oaxaca plant has not sufficient with which to run at full capacity. Certain it is, though, its difficulties with regard to sufficient capital have been straightened out, and the matter of ore will be greatly relieved on the completion of the San Juan de Oaxaca railroad (of Chas. A. Hamilton), which is to run from Oaxaca to Ejutla, and which is expected to reach Taviche by the end of July. Furthermore, up to the present time the freight and treatment charges in Oaxaca have been held at 12 *pesos* per ton, so that a great deal of fair ore has had to either remain in the mines or go over the dump, but which now should be handled at a profit. This new plant of the Oaxaca S. & R. Co. is thoroughly up-to-date in every particular, and wherever possible electricity has been employed, individual motors being used for mills, crushers, pumps, and

the like. The blowers are run by a Nordberg engine, as is also the main electric power-plant, which consists of a Westinghouse 100-kw. alternating-current generator of 440 volts and 60 cycles, with switchboard, exciter, etc., furnished by G. & O. Braniff, of Mexico City.

The Gardemo Co. is working the Gardemo mine, and soon there will be enough ore blocked out to keep the 16 stamps running.——For six months past C. S. Westbrook has been prospecting for copper with encouraging results; he also owns a number of gold prospects that are showing up well. Mr. Westbrook is associated with a number of wealthy miners in the United States, and has made arrangements to run a cross-cut over 700 metres to develop his silver property at San Vicente, near Coyuca de Catalan.

A right of exploration in the Zapote district has been granted to H. E. Shepherd, and he has recently made a number of rich gold strikes in this new locality. One of them is close to the San Jose river; the vein is in porphyry, about 28 in. wide, and averages 32 gm. gold per ton. He is at present treating the ore by *arrastres*, but expects to have a five-stamp mill running by the end of the rainy season.

The Taviche district of Oaxaca is experiencing a veritable boom. The San Francisco mine is making an excellent showing, taking up considerable ore running as high as 2,000 *pesos* per ton. The Treadwell Co. has made a rich strike of copper ore on the 300-ft. level, and the Consuela and Veronica look most promising.

In my letter of last week I referred to the small smelter of the Rio Tinto Mining Co. at Terrazas, 25 miles distant on the Mexican Central railroad, north of Chihuahua, and stated that in all probability this smelter would be closed down on the completion of the American Smelting & Refining Co.'s new plant at Chihuahua. Since the date of my letter it has been made public that the Rio Tinto mines and smelter have been sold for 1,500,000 *pesos* to a corporation to be known as the Rio Tinto Mines & Smelting Co., with a capital of 3,000,000 *pesos*, controlled by Martin J. Condon, president of the American Snuff Co., and associates. It is said to be the intention of the company to increase the present smelter at Terrazas to 600 tons capacity, and that orders have been placed for these additions. There are 25,000 tons of low-grade ore in the old dump that will be available with larger capacity. The existing smelter will be kept in operation until the completion of the new plant, which will require about eight months. Juan A. Creel, brother of Mexico's Ambassador to the United States, and manager of the Banco Minero, of Chihuahua, the richest bank in northern Mexico, who was one of the principal owners of the Rio Tinto mines, will retain a good interest in the new company.

The other owners are identified with the Veta Colorado Mining & Smelting Co., which owns the Veta Colorado, San Cristobal, Quebradillas, and Gran Bretaña in the Parral district, and which is also building a 500-ton mill at Minas Nuevas, near Parral. The new company has also obtained large holdings at Savonarola, about 35 miles west from Ortiz, on the Mexican Central, to which point a narrow-gauge road may be driven. While primarily for the treatment of its own ores, the new plant will also compete for custom ores as an entirely independent concern from the American Smelting & Refining Co. John N. A. Conner, manager of the Veta Colorado Mining and Smelting Co., will also be manager of the Rio Tinto Mines & Smelting Co. The only reason for discounting the statements of this company is the issue of a fine prospectus for the purpose of selling stock.

Leadville, Colorado.

The Mammoth Discovery.—An Important Event.—Good News From Sugar Loaf.—The Reindeer Mine.—Prospecting Schemes.—Car Shortage.—Treatment of Complex Ores.

The recent strike in the Mammoth shaft has excited the liveliest interest. In one of the first drifts opened, a large body of lead ore was exposed that averaged more than 30% lead and was rich in silver. Just before the previous operators were driven from the workings by a flood of water, considerable mineral was noticed in the floor of the drifts, but its importance was not realized. Since cleaning out the drifts, the present operators have come into possession of a lead shoot seven feet high, and have the shoot opened up for more than 20 ft., but it is too early to estimate the extent of this mineral body. As far as the local geologists can determine, it is an entirely new orebody; although one geologist, whose opinion carries weight, is of the opinion that it ties to one of the big shoots of Iron hill. At present but little exploration work is being done by the Mammoth owing to the fact that the 10-in. water-column, which is being installed, is not yet complete. Whatever the relationship of the ore-shoot to other deposits, the discovery adds an incalculable prospective value to a large area of virgin territory in that vicinity of Big Evans gulch. The company has practically completed one of the best power and pumping plants of the district, and will probably ship a considerable tonnage during the coming month.

Another important addition to the list of shippers is the Bartlett Tunnel. The manager reports that a large quantity of ore from the new shoot runs above $1,000 per ton, and that several carloads of ore shipped to the local smelter gave returns above $20,000 per car. The discovery in the Bartlett will stimulate development work on Sugar Loaf Mtn. and has given impetus to the work of the Dinero Co., since the latter will cut the Bartlett vein before reaching the Dinero vein some distance beyond. As formerly stated by your correspondent, the original Bartlett shaft was sunk on the vein to a depth of a little less than 300 ft., but was abandoned on account of a flood of water. An adit scheme was then conceived and a bore driven 1,300 ft., cutting the vein seven feet below the shaft. Several cars of ore were shipped, when the lease expired and the present company (styled the Halcyon) secured the ground. The lessees have sunk the shaft to a much greater depth and found a stronger shoot of ore than that worked by previous operators. For the past two weeks the Halcyon company has shipped more than 20 tons daily, much of which is rich.

It is reported that an important orebody has been opened upon the Reindeer on Rock hill. This part of the camp has developed into one of the best in the district, and the most substantial additions have been made during the past twelve months. Much local interest is being centred upon the development work in progress at the Hoffer shaft in lower Big Evans gulch. This shaft reached the blue lime at 300-ft. depth and a drift driven from the bottom of the shaft toward the south has exposed considerable mineral in the form of patches of lead and iron sulphides. These deposits, while not important in themselves, lead the promoters of the enterprise to believe an orebody will soon be developed. It is proposed to sink the shaft 200 ft. deeper, where the white lime should be found according to the information furnished by the Coronado workings. With the sinking of the Penrose shaft, the Hoffer shaft was drained, thus materially cheapening the process of shaft sinking.

The success that has attended the Boston-Arizona mill at the foot of Harrison avenue, has induced the company to increase the capacity to 200 tons daily. This mill was

erected to treat the Emmett dump for its zinc contents. The demand for zinc has rendered it necessary for many properties throughout the district to add milling plants. There are several million tons of zinc ore that will yield a fair profit tied up in the big dumps of Leadville, and these are gradually coming into the market. The famous A. Y. & Minnie and Col. Sellers dumps will soon cease to be landmarks, and the new mill owned by the Leadville District Mining Co. has begun to treat the Ibex dump (Little Johnny) at the rate of 100 tons daily.

There is a certain quantity of ore being developed that it is difficult to market without previous treatment, for instance, such ore as runs high in zinc and at the same time carries lead and silver. The lead smelters are not prepared to handle the zinc and the zinc smelters object to a settlement on the lead and silver basis. The United States Smelting Co. is receiving a considerable tonnage of this material and certain Eastern plants purchase moderate quantities. The Iron-Silver company has finally contracted with the U. S. Smelting Co. and a zinc smelter at Coffeeville, Kansas, for treatment on 1,000 tons monthly of this product.——Two new boilers have been installed at the Helena in Iowa gulch, and as soon as the water can be beaten down again the shaft will be sunk another lift. A good vein of sulphides was cut at the 500-ft. level, but this will be held in reserve until further development work has been carried on below.

Cripple Creek, Colorado.

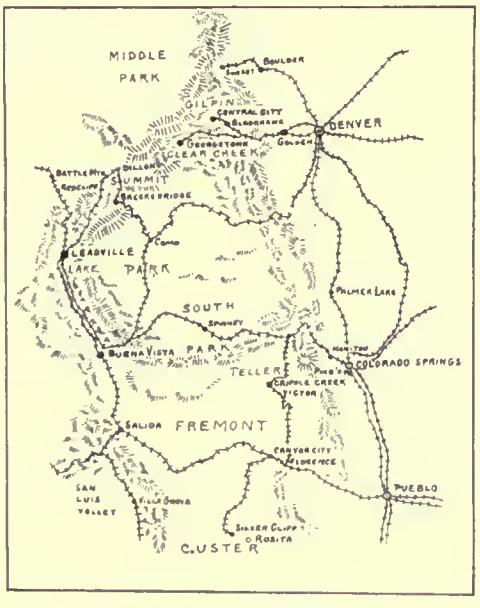
Unwatering the Gold Coin.—Scarcity of Drill-Men.—Union Leasing Co.—Contract for Drainage Adit.—Cave in the Portland.

Shipments of ore from the Mohican mine on Battle Mtn. have been stopped temporarily owing to litigation in which the Mohican company has brought action to restrain Anderson & Olsen, lessees, from operating the property. In view of an early settlement of the lawsuit, the lessees are now blocking out ore on the 700-ft. level near the shaft. The vein varies in width from 3 to 5 ft., the ore shipped averaging $25 per ton.——The unwatering of the Gold Coin shaft is progressing rapidly by means of the pump on the 1,000-ft. level and the two bailers, and the shaft should be drained to the 1,200-ft. level within two or three weeks. The water is raised to within 130 ft. of the collar of the shaft, where it is conveyed through the Columbine tunnel into Eclipse gulch, a distance of three-quarters of a mile.

The Cripple Creek district is at the present time suffering from a scarcity of men, especially machine-men. Many of the mines are running shorthanded, retarding operations to a certain extent.—— The Union Leasing Co., operating in the Husted shaft of the Mabel M. claim of the Gold Dollar Co., on Beacon hill, has decided to sink the shaft from the 200 to the 600-ft. level. A good orebody was encountered on the 300-ft. level of the Mabel M. shaft in a cross-cut to the south; it is hoped to cut it at greater depth.—— Good ore is being shipped by D. Whitney and J. McMullin from their lease on the 800-ft. level of No. 2 shaft of the Vindicator, on Bull hill. A new orebody has recently been opened up in a raise between the 700 and 800-ft. levels. The ore is being stoped by three machines for an average width of 3½ ft., the screening from which runs in the neighborhood of $30, and the bulk ore from $50 to $80 per ton. On the 500-ft. level ore is also being broken by one machine from a vein five feet wide.

The contract for driving the drainage adit has been awarded to Charles Lund and Charles Stream, and their $20,000 bond to insure the company against all liens has been approved. A rate of 350 ft. per month is to be maintained by the contractors, the adit to be 7 by 10 ft. in the clear. The Tunnel Company will furnish all timbers, pipe, and rails, as well as the necessary power. Seventy-five per cent of the amount due each month will be paid the contractors, the remainder to be withheld until the completion of the contract. It is proposed to sink an intermediate shaft from the surface at a distance of 9,000 ft. from the mouth. This shaft will be between 600 to 700 ft. deep and will materially decrease the time of driving the bore. A boarding-house to accommodate the employees has been started by Charles Lund, as the mouth of the adit is several miles from the town of Cripple Creek.

A contract has been let to Oscar Anderson to sink the new Dante shaft on Bull hill from the present depth of 120 ft. to the point where it will connect with the workings above the Trail tunnel, a distance of 150 ft. The British American Mining Co. has this property under



A Part of Colorado.

lease and is sinking the shaft so as to facilitate the handling of a large production. The production at the present time is limited, owing to the long tram through the Trail tunnel, a distance of 3,000 ft. The contractor is to receive $8 per foot and put in all timbers, but the latter, as well as all supplies, will be furnished by the company, which will also do the hoisting. It is estimated that there are about 5,000 tons of ore already broken in the stopes, but only occasional shipments are being made pending the completion of the shaft. The portion of the Trail tunnel on the claim of that name is under lease to B. G. Granville, who has recently opened up a good vein between 2 and 3 ft. wide. Shipments run about $25 per ton. Granville has rented the Van Fleet cyanide mill, at Goldfield, and he proposes to treat the ore from his lease. Experimental tests are now being made.—— The Western Investment Co. is also leasing on the Trail tunnel and has encountered the extension of the Dante vein. The vein is here about 10 ft. wide and two shipments recently made have given returns around $20 per ton.

A cave occurred at the Portland mine, on Battle Mtn. The surface ground under a part of the No. 2 dump gave way, causing about 10,000 tons of waste rock to fall into the open stopes down as far as the 100-ft. level. Here its descent was arrested by a thin shell of ground, which prevented the rock from going to the 900-ft. level, which it would otherwise have done. Owing to the sinking of the dump, the tram from the ore-house has been temporarily put out of commission.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

CORROSION of a boiler causes pitting and honeycombing of the tubes, shell, and other exposed parts, rapidly weakening the boiler, and thus rendering it dangerous.

PHOSPHORUS combines readily with molten copper, but small proportions of the element have no injurious effects. Larger amounts, however, over 0.5%, render it red-short.

BASIC PIG IRON in America is pig iron containing so little silicon (not more than 1%) and sulphur that it is suited for easy conversion into steel by the basic open-hearth process.

SALT is not confined to any particular geological horizon, but it is found in nearly all unmetamorphosed sedimentary rocks, including those which are forming at the present day.

FOR the treatment by cyanide of non-refractory ores, wet crushing takes precedence, owing to the large output usually obtained. And for the wet-crushing, the gravity-stamp is most used.

VARIOUS precipitants for gold, in cyanide solutions, other than zinc shavings, have been tried from time to time, such as aluminum, sodium amalgam, zinc dust or fume, and electricity.

THE fluorspar-bearing belt of the Kentucky-Illinois district forms a zone of Mississippian (Lower Carboniferous) limestone ubout 75 miles long, from northwest to southeast, and 30 miles wide.

WHEN a claim is owned with a partner and another claim is held under individual ownership, it is unsafe to do the work on the partnership claim with the idea of applying such work to all the claims.

THE best form of wire rope for splicing is that made with six strands, as the strands are then the exact size for the core of rope, and are readily substituted for the core as it is being pulled out to allow the strands to take its place.

PRIMING AND FOAMING in a boiler are both extremely annoying and make various kinds of trouble. The efficiency of the engine is greatly decreased through water getting into the cylinders, and cylinders are wrecked, and cross-heads and connecting rods broken.

THE most valuable members of the asphaltum series are ozocerite, wurzilite, grahamite, and gilsonite. With the exception of grahamite, these occur in commercially important quantities, as far as yet reported, only in the State of Utah. They are prized for the manufacture of certain varnishes and for the insulation of electric wires.

APATITE, a crystallized mineral consisting essentially of phosphate of lime, occurs in igneous rocks in many parts of the United States, particularly in St. Lawrence county, New York, but nowhere in sufficiently large quantities to pay for mining. Apatite has been mined to some extent in Canada in previous years, but its production has ceased.

THE usual form of machine for generating the current for electric blasting, is a small hand dynamo, in which the armature is caused to revolve between the poles of the magnet by means of a rack and pinion during the down stroke of a handle. As soon as the lower end of the rack comes in contact with the contact-breaker at the bottom, the current is directed to the outside circuit of fuses and the explosion takes place.

THERE is practically no production of metallic tin in the United States, the only production being an insignificant quantity of ore from the placers of Buck Creek, Alaska. There is no output from the lode claims of the York region, Alaska; none from South Carolina, although 18 tons were washed from the residual placers at Gaffney, in the northern part of that State, in one year; nor is there much production reported from the Black Hills region of South Dakota and Wyoming.

THE high price of diamonds has made the search for these precious stones in the United States and Canada keener than ever before. In the examination by the United States Geological Survey of many samples of gold and platinum sands during the Lewis & Clark Exposition at Portland, diamonds were carefully looked for. Diamonds have been watched for also by a number of parties that have been dredging for gold on an extensive scale in the rivers of California, but in neither case have any finds been reported.

ALL natural waters contain more or less foreign matter, either in solution or suspension. These impurities produce three general deleterious effects, which are priming or foaming, corrosion, and scale deposition. Those impurities which tend to cause priming are sodium carbonate, organic matter, and various alkalies; those causing corrosion are sulphuric, nitric, hydrochloric, tannic, and acetic acids, chloride, and sulphate of magnesia, organic matter, and sugars; while those tending to cause scale are carbonates, sulphates of lime and magnesia, soluble salts, silica, oxides of iron, alumina, mud and sand in suspension, and organic matter.

PURE gypsum is white and, when in the crystalline form, translucent. The impurities which it commonly contains usually destroy its translucency and affect its color, so that the mineral as mined is an opaque, fine-grained mass, varying from white to reddish, gray, or brown in color. Gypsum can be distinguished from most other minerals by its extreme softness, for even when in the crystalline form it can be readily scratched by the finger nail. When treated with acids it does not effervesce. On heating it loses its water of crystallization and, if previously translucent, becomes a chalky opaque white. Pure crystalline specimens have a specific gravity of 2.30 to 2.33.

IN THE Elmore oil process of concentration, the pulp from Huntington mills passes directly into the open end of a horizontal rotating drum, inside of which is a helix with paddles that lift up the pulp and drop it again, at the same time propelling it forward. With the pulp is admitted a small quantity of thick, sticky oil, which is subjected to the same agitation as the pulp. This oil exercises the remarkable property of sticking to and buoying up the particles of metallic minerals that are suspended in the pulp, but it does not stick to or effect the particles of rock gangue. The oil and pulp discharge into a spitzkasten, in which the tailing settles to the bottom, while the oil floats to the top and carries off the valuable mineral. This mixture is then run into a centrifugal machine, where the oil and mineral are separated.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Requirements of Modern Mining.

The Editor:

Sir—I read with exceptional interest the article by J. R. Finlay on 'The Requirements of Modern Mining,' which appeared in the issue of April 20. It seemed to me both instructive and suggestive, and I have looked to see an edifying discussion initiated by it.

The texts for such discussion appeared to me to be found in the following sentences: "In its broad aspects mining is far more a question of human relations and facts, than of natural relations and facts," and "It is a comfort to know that the business of mining is no fake, but a most essential—and perhaps the most distinctive—part of modern civilization." The thought that these statements carried for me was that they are true and have been made true by the faithful diligent study of the mining engineer.

Mr. Finlay analyzes the business of mining into five divisions. The first of these, covering ore and mineral deposits, he places entirely in "the realm of natural phenomena and facts." Now, while this is true in a sense as a feature of Mr. Finlay's argument, 'ore,' as a matter of fact, is rock that will yield a margin of profit above cost of extraction and treatment. The mining engineer has been the most important factor in changing the significance of natural phenomena and making 'ore' out of what was formerly worthless 'rock.' The world may never again see a Comstock bonanza, but vast areas of porphyry, lately only country rock, are going to yield in the aggregate more millions than ever came from all the world's bonanzas of high-grade ore. While industrial development in other lines has been prodigious and has aided much in bringing about the above condition, it is none the less true that without the evolution of the exact science of mining and ore-treatment by the mining engineer this porphyry would not be ore and the "natural phenomena" involved would have a very different significance.

Of course, as civilization advances and wealth increases, it requires more and more skillful figuring to insure profit. This is true in every line of endeavor. To make money out of a railroad, bank, department store, or factory requires a high order of financial and administrative ability. The point that Mr. Finlay has made so clear is that the mining engineer has lifted his profession into equal dignity and importance with any other class of business enterprises and perhaps made the results more certain than in any other line.

The question that he raises seems to me to be: What change, if any, must be made in the curriculum of the schools to best fit the mining engineer for the changed conditions that have come, partly through the achievements of the profession, and partly from changed conditions generally in the world, and for the engineer who has left the schools and is in practice, what shall be the character of study best calculated to increase his efficiency and chance of great success?

The mining industry has justly won the confidence of men. The demand for its product outruns the supply. Civilization is in need of an increasing output of metals. The profession that has achieved this result is entitled to the amplest reward. How shall it be secured.

JAMES W. ABBOTT.

Pioche, Nevada, June 8.

Blast-Furnace vs. Reverberatory.

The Editor:

Sir—In looking over the contribution of Mr. Harry Charles in your issue of January 26, I see several points that I desire to discuss, as the intent of the questions seems to have been misunderstood.

1. *On what should the choice of furnace type be principally based? Choice of ore, fuel, fluxes, building materials?*

It seems to me that the choice of furnace must in large part be governed by the type of slag that will be of greatest economical value to the operator. It is safe to say that in the reverberatory the flux for the silica of the ore is furnished by the iron, and in the blast-furnace it is (to the extent of nearly, or quite, one-half) furnished by lime. The contents of the ore in question as regards these fluxing qualities should therefore enter into the question to at least as great an extent as the question of physical character. Silica is the great enemy of the smelter-man. To make the cleanest slag carrying the most silica, and at the same time get speed of smelting, is the governing question in practically every works.

In the blast-furnace one can smelt any character of ore, producing any type of slag, as far as the chemical reactions are concerned, but the physical conditions must be perfected to get the best results, that is, the fine must be agglomerated, or too much loss by flue-dust will result. The reverberatory furnace should only handle *hot* material fresh from the roasting furnaces, and this practically precludes the use of much lime flux, as the limestone would add materially to the cost of the roasting operation and of the roasting plant. This, therefore, brings us again to the chemical analysis of the ore in question, and we find that the reverberatory is best suited to such ores or materials as require roasting, and are either naturally or artificially fine, and carry sufficient iron for their own fluxing.

Even if we accept this description of the characteristics of the reverberatory ores, we must ask the question, is it commercial to use the iron of this ore to flux all the silica of the charge, or would it not be more profitable to use some lime instead, particularly as this addition tends to reduce the metal-losses? If our irony material carries little metal-value aside from the flux-value, and the silicious ores to be added to the charge must be looked to for the profits of the operation, we shall naturally turn to that type of slag and furnace in which we get the greatest flux-value of the ore. This is undoubtedly obtained in the blast-furnace, and there can be no doubt that in many such cases it would pay either to briquette or sinter the fine iron-sulphide and smelt in the blast-furnace, rather than to roast them and smelt in the reverberatory. In the Montana case cited by Mr. Charles the charges of the blast and reverberatory furnaces were radically different, hence the comparison of slag-volumes produced and the deductions based on it are wrong. If the iron material sent to the reverberatory had been smelted in the blast-furnace to make the same type of slag as the reverberatory made, there is no doubt as to the comparative slag-losses; the blast-furnace would be way ahead. As it is, his figures are misleading, the materials smelted in the plant in question averaged close to 7%, not 2% Cu, and the reverberatory slags averaged not 0.25%, but closer to 0.6% Cu, and if the calculation is made on this basis, it comes out in favor of the blast-furnace. I agree with Mr. Charles that a plant containing both types of furnaces is the best, but instead of using the reverberatory as the smelting furnace and the blast-furnace as a sort of sewer into which all the odds and ends and clean-ups are thrown, I

would do my work in the blast-furnace and roast and smelt only such material in the reverberatory as is not profitable in the blast. This would include probably much of the flue-dust and such fine concentrate as is too silicious to afford much free iron.

2. *What are the comparative costs per ton of daily capacity of each type of furnace?*

Mr. Charles mistakes this question, which refers to the cost of the plant, not of the *operation*. The figures that he uses, however, are so far from the actual cost of the operation at Butte that they must have been used by him merely suggestively.

5. *What are the comparative costs of power, labor, fuel, and repairs?*

COMPARATIVE COSTS.

	Blast-furnace.	Reverberatory.
	%	%
Power	9.4	2.2
Labor	25.5	32.4
Fuel	42.7	57.7
Repairs	5.1	8.9

These percentages are of the total cost of each furnace-operation.

There is no doubt of the efficiency and economy of boilers placed in the flues of reverberatory furnaces, nor of the advantages gained thereby, over such furnaces without boilers, but this matter has been carried so far as to advocate the reverberatory system simply on account of this gain in boiler-power. I think it probable that the use of part of this waste heat to pre-heat the air for combustion in the furnace itself would result in almost as great a saving as in boilers.

6. *What are the comparative amounts of capital tied up in furnaces of each type, and how does this affect the cost per ton of daily capacity, or of output?*

Two hundred tons of 40% matte carrying 30 oz. silver per ton, at present metal prices, and at 10% interest, amounts to about eight cents per ton on 150 tons per day for 350 days. The bottom of a reverberatory furnace absorbs an unknown amount of metal, sufficient to bring this charge up to at least 10c. per ton. In the case where the mattes are higher in gold and silver than at Butte, this item becomes of much moment, particularly on gold ores.

7. *What are the limiting necessities in the way of fuel for each type?*

I am inclined to think that the limits of useful coals for the reverberatory work is a much narrower one than for coke for the blast-furnace. It is easier to do good work on poor coke than on poor coal, and the tonnage of the reverberatory is much more dependent on the fuel than is the blast-furnace. Naturally, as the ash in the coke runs up to 22% one must use more of it, but if the coal for the reverberatory happens to have an easily fusible ash, trouble is constant, and large capacity impossible. Thus, two mines in the same district of Rock Springs do not produce the same coal; one is good, the other bad on account of the fusibility of the ash, and an addition of 33% of the poor kind will cut the furnace tonnage 50 per cent.

If the coal becomes too poor, it is necessary to go into the gas-fired reverberatory furnace, with its producers, regenerative checker work, and other expensive adjuncts. Wood is not to be considered any more. Oil is demonstrated as an excellent fuel for the reverberatory, but it is not everywhere obtainable, neither is Rock Springs slack, and I do not know of any large or successful reverberatory plant that is out of reach of one or the other of these fuels, unless it uses producer-gas.

8. *What are the comparative losses in slag, dust, or middle products?*

9. *What are the defining limits of each type in regard to slag composition?*

10. *How do these differences in slag figure out in financial margins per ton smelted?*

As these three questions are so intimately associated, I have grouped them. The slag-assays and analyses given in my first contribution* show the comparative losses, and as some of your readers will not have them at hand I repeat briefly:

	Reverberatory.		Blast-furnace.	
Slag.	1901.	Half of 1905.	1904.	Half o 1905.
Ag	0.348 oz.	0.352 oz.	0.116 oz.	0.114 oz.
	%	%	%	%
Cu	0.716	0.582	0.315	0.302
Fe	27.62	31.90	18.00	20.30
SiO_2	46.6	42.20	46.2	44.50
CaO	4.17	3.31	18.30	17.10
Al_2O_3	8.60	7.64	7.42	7.02
Matte.				
Ag	25.8 oz.	21.7 oz.	33.6 oz.	28.2 oz.
Cu	45.0%	39.5%	41.5%	36.2%

These are actual averages of all weekly average samples, and the assays for copper are electrolytic. They were made at the works of which Mr. Charles had charge at Butte during part of the period. The highest weekly average was 53% silica on reverberatory and 48.5% on the blast; the lowest was 40.0% silica on reverberatory and 42.2% on the blast. The drop in silica and increase in iron content of the slags in the half of 1905 resulted in an increase in tonnage in the reverberatory of 24%, and on the blast-furnaces of 10.3%. If we take the most favorable returns for the last half-year, we find the difference in favor of the blast-furnace slag as being: Ag 0.238 oz. and Cu 0.28%, at present prices of 64c. for the silver, and 20c. for the copper, this is equal to $1.28 per ton of slag. I think that the comparison of metal losses in the two slags should be made on the basis of the silica contents of the slags, as this is the material that has to be fluxed; figured on this basis the blast-furnace has the more silicious slag, and thus there is a further gain. The total cost of limestone for the blast-furnaces was 37c. per ton of ore.

While it is not "necessary" to combine all the silica in the reverberatory furnace, part of it being at times removable as 'floaters,' I do not think that this practice will appeal to the metallurgist, who has to consider the losses in silver, gold, and copper, in his ores, as it is altogether too probable that the uncombined silica will carry with it too much of the precious metals wherever the ores are of a good grade. If Mr. Charles' experience at the Bingham plant controverts this, it would be of general interest to know just what such 'floaters' assay in comparison to the grade of slag and matte.

11. *What method of charging do you advocate for a copper furnace (assuming the atmosphere to be oxidizing?)*

I was trying to provoke discussion not only as to the advantage or otherwise of mechanical charging, but also as to the best methods of doing this, and the best placing of the coke, fine, and coarse in the furnace. Naturally, when dumping from cars there is no room for discussion, the materials just "get there."

12. *Would you bind, in some manner, all fine for use in the blast-furnace? Incidentally, what are the difficulties of treating fine ore in the blast-furnace?*

If I had slime from a concentrating mill at hand, I would use this to bind as much of the fine material as possible, I would try every known or suggested binder, or sintering device, and I would send only such and so much material to the reverberatory plant as could not be used in the blast-furnace. Does it appeal to the scientific constructor to erect a beautiful furnace of fire-brick and steel to fill it with glisteuing sand for a bottom, and then subject the entire structure to a heat nearly double that

*MINING AND SCIENTIFIC PRESS, March 3, 1906.

of the ordinary operation, in order to smelt in that sand-bottom? And when the furnace is opened after that trial, and the breathless constructor gets his eye adjusted to the glare, is he happy to see his bridge-wall or flue, or some other equally important part of the structure, practically destroyed? And is it not a severe tax to have to build a 'by-pass' flue, often a very expensive one too, in order to conduct the excessive heat of this bottom-smelting operation around the boilers, and sometimes away from the regular stack, if it be of steel construction? Is that metallurgy, or is it something else? And suppose the furnace, flue, and stack bear up under the trial, and the bottom is finally also soaked with low-grade matte, and the furnace is, after a week or ten days, working up to normal charges, then if finally that beautiful quartz-bottom floats calmly up to the surface of the matte and appears at the slag-doors clamoring for exit, is it likely to make you feel cheerful? I say, give me the blast-furnace!

JAMES W. NEILL.

Salt Lake, May 18.

On Technical Writing.

The Editor:

Sir—It is singular but nevertheless true, that unscrupulous promoters and fake 'experts' have evolved a large number of words and expressions which, once recognized, serve as splendid danger signals to warn the would-be investor. The reason for this style of writing seems to be due to the fact that the unscientific brain can handle only generalities and the ignorant man bursts into parables and figures of speech. Also the gullible public would rather invest in "yellow metal," "white metal," or "red metal" "propositions" than in gold, silver, or copper mines, so the fake promoter and his 'expert' pass out the figures of speech to the appreciative throng. I have noticed that our best-known engineers and technical writers avoid these stock expressions and this fact makes it reasonably safe to ignore mine reports expressed in the lurid language of the spoofer.

Long acquaintance with the PRESS had convinced me that it never used any of these figures of speech. It was a shock, therefore, to find the expression "grass-roots," in your editorial, "A Question of Practical Mining" in the issue of June 8. This particular figure of speech may be considered to be the working tool of the parasites on the mining profession. Presumably it is used as a synonym of "surface," but it is inexact, and therefore unscientific. We all know that grass-roots are sometimes found at depths that would scarcely be credited. The figure is not beautiful, and, in fact, cannot be defended on any ground. Let us relegate the "grass-roots" along with the "true fissures" and other expressions to hat great "treasure house which Nature has prepared twlth such a lavish hand"—the brain of the spoofer.

G. B. W.

Salt Lake, June 17.

[The objection is well taken.—Editor.]

ACCORDING to Moissan, gold can be easily distilled in the electric furnace. It boils at a higher temperature than copper and condenses on the cold tube in filiform masses and microscopic crystals, which have all the characteristics of ordinary gold in fine division. In alloys of gold and copper, or gold and tin, the copper or tin distills before the gold. In distilling gold-tin alloys, a finely divided mixture of stannic oxide, lime and gold is obtained, having the color and properties of purple of Cassius.

The Odor of Metals.

Water chemically pure is a colorless, tasteless, odorless fluid; but in combination with other forms of matter it acquires each and all of these characteristics. Similarly it has been asserted by scientific authorities that metals free from alloys are odorless. In combination with other metals they frequently develop a strongly marked and sometimes a disagreeable smell, as in the case of copper alloys. Still the major premise was declared to hold until recently, when, according to report, as the result of exhaustive experiment, it has been established that all metals have their distinctive odors, which under set circumstances can be very perceptibly demonstrated. The proponent of the new theory is Herr Karl Gruhn, a Berlin metallurgical chemist and mineralogist, who has devoted much time and attention to the elucidation of his subject, and claims to have fully ascertained the origin and characteristics of the metallic odors. As a primary result of his experiments he asserts that even in its normal state each of the metals has its distinctive emanation, which is, however, so faintly perceptible as to have induced the assertion respecting its non-existence. This effluxion increases with the increase of temperature to a remarkable degree, and the rule applies equally to the royal as to the industrial metals. It is, however, most noticeable in connection with the latter, tin, copper, zinc, lead, and iron furnishing similar evidences of its application; and the odor is not at all affected by the oxidizing of the metal. Herr Gruhn found that each and all of the metals named when subjected to a high and sustained temperature gives out its odor in fullest strength after about an hour's treatment, but it then decreases, even when the temperature is still sustained, till the smell becomes as faint as before the temperature was raised. Then when the heat is withdrawn and the metal is allowed to cool, all trace of the odor disappears, as if it had been utterly driven off. An immediate return to high temperature re-develops the smell in only a faintly perceptible degree, but if a few hours are allowed to elapse before the metal is again heated it repeats in full strength all the phenomena attending the first test. It appears to have recovered from the exhaustion of its emanation and to have re-charged itself with the agents producing the odor. From these facts and the other data collected, Herr Gruhn arrives at a conclusion which challenges another commonly accepted belief. He disputes the theory that smells in their infinite variety are all produced by the effect upon the olfactory nerves of volatilized atoms from the effluxing substance which mix with the atmosphere, and so excite the sense. He says this is most decidedly not so in the case of metallic odors, which he affirms to be a property stored up by the substance and retained in a state almost quiescent till under the heat stimulus it is given off as are the radio-active properties of other minerals, and that as in the case of radium the emanations are unaccompanied by chemical change or loss of weight. The difference is that in the case of the odor there is an exhaust which is repaired by re-absorption, which in its turn is unaccompanied by chemical change or increase of weight. This relation to the radio-active properties of the uranian group and other allied minerals is indeed the asserted fact upon which Herr Gruhn lays chiefest stress, for he claims to have separated and isolated a metallic odor, and to have found that in its manifestations it establishes a strong affinity to the radio-active emanations of the rarer minerals.—*The Australian Mining Standard.*

SADDLE REEFS are characteristic of Bendigo; the Broken Hill lode is also claimed to be an anticlinal lode.

The Filtration of Slime by the Butters Method.

Written for the MINING AND SCIENTIFIC PRESS
By E. M. HAMILTON.

[CONTINUED FROM PAGE 789.]

METHOD OF PROCEDURE.—It is assumed that the filter-box is empty and one of the deep settlement-vats has been charged to its full capacity and has had time for settlement and decantation, and that the pulp therein is composed of about 1 part of slime to 2 of solution. This vat has six 12-in. iron plugs in the bottom, connected by iron rods to a screw and wheel attachment at the top of the vat, by which they may be opened or closed from above. The seats of these valves are all connected by tees to the 6-in. pipe of the centrifugal pump.

In order to put the filter in operation, the shift-man first opens up two of the plugs in the deep vat; he then returns to his station and opens the valve between the vat and the pump, and by turning his winches sets the 3-way valves in position to draw from the feed-vat and discharge into the bottom of the filter-box. As soon as the box is full the pump is stopped and the valve to the vacuum-drum is opened, putting each filter-leaf in direct communication with the vacuum-pump, which is now in action. Very soon a subsidence in the level of the pulp is apparent, due to the withdrawal of liquor through the filters; the 6-in. pump is then started again to supply fresh pulp to the box, and this is repeated at short intervals so as to keep the level of the pulp always above the line of permeability of the leaves. The solution, which is drawn from the pulp into the vacuum-drum continually, gravitates into the small sump and is periodically pumped into the precipitation vat, as before described.

The thickness of cake allowed to accumulate on the leaves varies from ¼ to 1 in. and these seem to be the economical limits; a thickness of over one inch necessitates a disproportionately longer time to collect and wash the cake, because the deposition becomes slower and slower with increased thickness, and the cake is more liable to drop from its support when the pulp is withdrawn; while if less than ¾ in. be used economy is again interfered with owing to the time needed for the subsequent operations being spent over too small a tonnage of material.

The time needed to accumulate a ¾-in. cake varies with the amount of moisture held in the pulp and with the quality of the slime, and may be from 15 minutes to an hour. The progress of formation is estimated from time to time by reaching the hand down below the level of the pulp and passing a short stick, such as a wooden match, through the cake and noting the measurement between the canvas surface and the finger and thumb.

As soon as the necessary point has been reached no more pulp is supplied to the box, but, the 3-way valves being reversed, the pump is again started, when the suction and delivery lines reverse their functions and the pulp remaining in the box is withdrawn and thrown back into the feed-vat. Immediately after starting this reverse motion of the pulp, a small valve is partially opened; this admits air to the vacuum-drum, and is so regulated that the mercury shall not register over 6 to 9 in. vacuum. The correct height for each kind of slime has to be ascertained by trial, the object being to have it as low as possible consistently with holding the cake in contact with the canvas. This is an important point; during the preliminary experiments it was found that when the box was emptied of pulp and the surfaces of the cakes exposed to the atmosphere, the passage of air through the pores rapidly dried the deposited slime and caused cracks, which rendered a perfect washing of the residue impossible. By lowering the vacuum to a point sufficient to hold the cake firmly in position and yet cause a minimum of air to pass through it, the difficulty was overcome and the cracking prevented.

When the box is nearly empty, the spray of solution is turned on, washing down the sides and bottom, and removing any light slime that may be adhering to them.

As soon as the last of the pulp has been removed, the main slime-valve is closed, and another one is opened to admit precipitated solution to the pump, by which means the filters with their adhering cakes are again completely

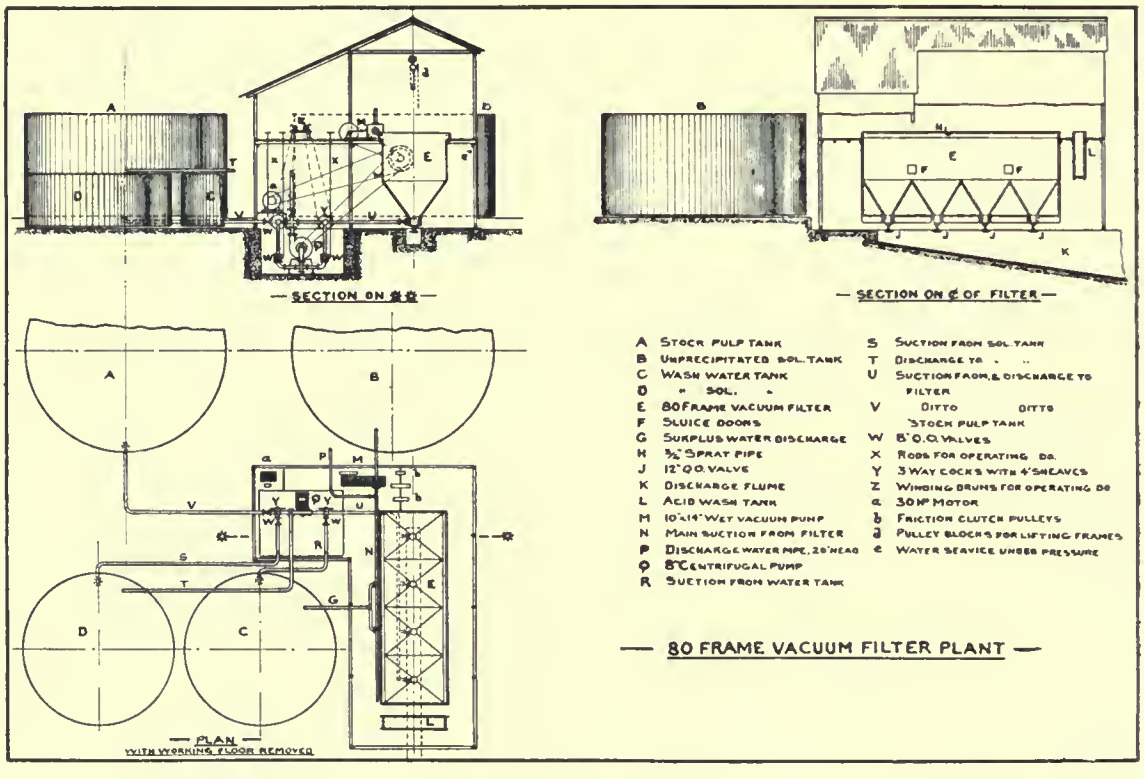

— SECTION ON ✱✱ —
— SECTION ON ℄ OF FILTER —
A STOCK PULP TANK
B UNPRECIPITATED SOL. TANK
C WASH WATER TANK
D " SOL. "
E 80 FRAME VACUUM FILTER
F SLUICE DOORS
G SURPLUS WATER DISCHARGE
H ⅜" SPRAY PIPE
J 12" Q.O. VALVE
K DISCHARGE FLUME
L ACID WASH TANK
M 10"×14" WET VACUUM PUMP
N MAIN SUCTION FROM FILTER
P DISCHARGE WATER PIPE, 20' HEAD
Q 8" CENTRIFUGAL PUMP
R SUCTION FROM WATER TANK
S SUCTION FROM SOL. TANK
T DISCHARGE TO " "
U SUCTION FROM & DISCHARGE TO FILTER
V DITTO DITTO STOCK PULP TANK
W 8" Q.O. VALVES
X RODS FOR OPERATING DO.
Y 3 WAY COCKS WITH 4" SHEAVES
Z WINDING DRUMS FOR OPERATING DO
a 30 HP MOTOR
b FRICTION CLUTCH PULLEYS
d PULLEY BLOCKS FOR LIFTING FRAMES
e WATER SERVICE UNDER PRESSURE
— PLAN — WITH WORKING FLOOR REMOVED
— 80 FRAME VACUUM FILTER PLANT —

Fig. 10.

covered with liquor. As soon as this has been accomplished the air-valve is closed and the full vacuum a second time thrown on the leaves, so as to draw the wash-solution through the cake and displace the dissolved gold and silver contained therein, the level being maintained, as before, so as to keep all filtering surface covered with solution. The time required for this wash varies with the thickness of the cake and the quantity of solution that it is deemed desirable to pass through it. As a rule it is found that by drawing through an amount of liquor equal to twice the amount of moisture held in the cake a sufficient displacement is effected for practical requirements. In cases, however, where the solution accompanying the pulp is especially rich in gold and silver, a wash equal in quantity to three times that of the moisture in the cake may have to be given. When the washing process has been continued long enough, the vacuum is again lowered, and by resetting the 3-way valves the remaining solution is returned to the vat whence it came. (See diagram of pump connections, Fig. 4.) The solution-valve is then closed and water is thrown through the common 6-in. pipe until the filter-leaves are again submerged; the vacuum is put on for a few minutes to displace any solution that may be lying in the pipes, and is then entirely cut off and the valve is opened; water then enters each leaf through the vacuum connections, throwing off the cake, which drops to the bottom, and cleansing the canvas in preparation for the next charge. All that now remains to be done is to open the four discharge-doors and allow the contents, both water and hard slime, to gravitate to the waste-dam, open the end-doors, and wash out the interior thoroughly with the hose. After closing all the doors the filter is ready for a new charge.

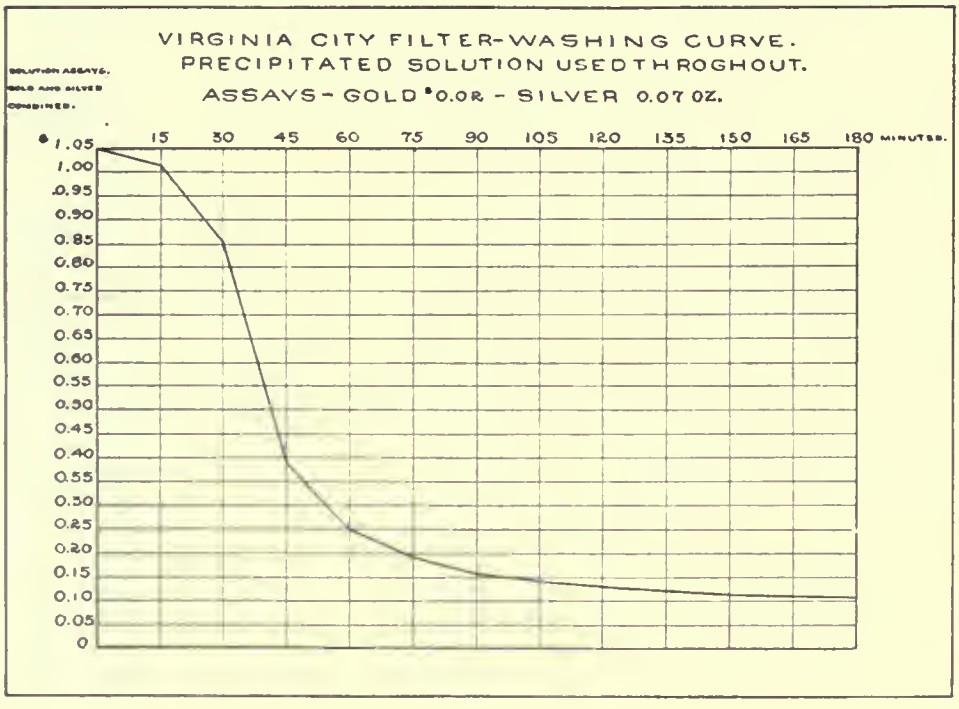

VIRGINIA CITY FILTER-WASHING CURVE.
PRECIPITATED SOLUTION USED THROGHOUT.
ASSAYS - GOLD 0.08 - SILVER 0.07 OZ.
SOLUTION ASSAYS. GOLD AND SILVER COMBINED.
15 30 45 60 75 90 105 120 135 150 165 180 MINUTES.
1.05 1.00 0.95 0.90 0.85 0.80 0.75 0.70 0.65 0.60 0.55 0.50 0.45 0.40 0.55 0.30 0.25 0.20 0.15 0.10 0.05 0

Fig. 6.

Precipitated solution is not invariably used for displacing the valuable moisture in the cake; when the stock of solution in circulation through the plant is low, it is brought up to bulk by using water instead of solution for this purpose, in this case, of course, the necessity for a transferrence after washing is removed, and when the requisite number of tons of water has been drawn through the cake it is at once discharged, together with all the surplus water remaining in the box.

In localities where water is scarce it is not necessary to waste all the water standing in the box at the time the cake is thrown off; before dumping the residue, this water may be decanted to the level of the slime and stored for further use.

At the Minas Prietas plant of Charles Butters & Co., compressed air alone is used for dropping the cake, and the residue is run out to the dump in cars. The use of water and air together, however, as already described, is considered an improvement.

WORKING COSTS AT VIRGINIA CITY.—The two chief items of expense are power and labor.

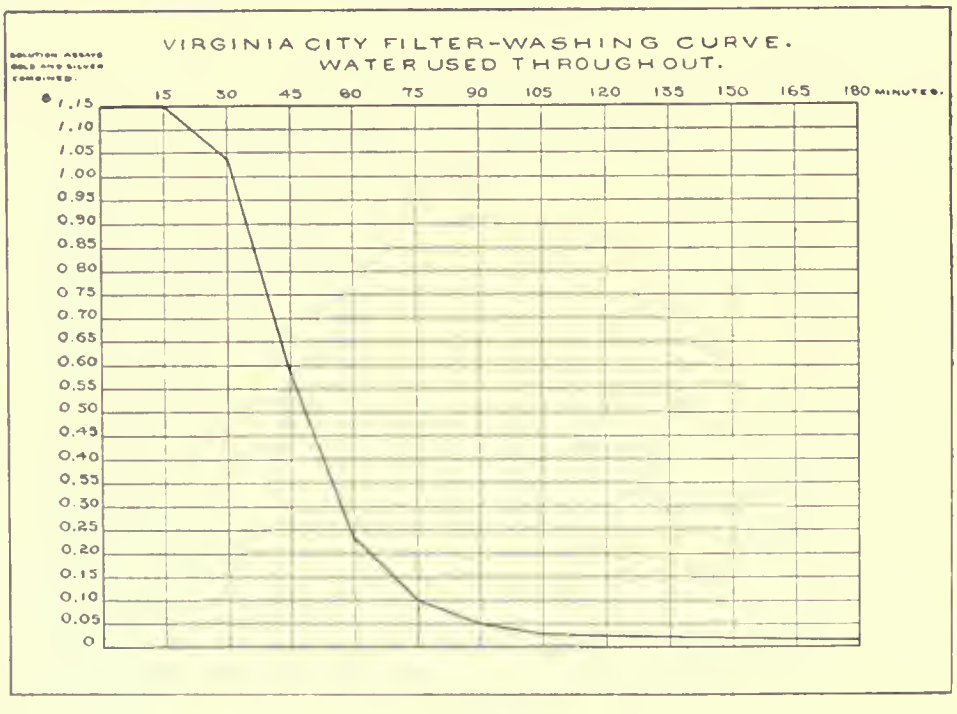


Fig. 7.

1. Labor.—As already stated, the filter requires only one man on each shift, or three men for 24 hours. Taking the rate of wages as $3 per 8-hour shift the labor bill will amount to $9 for handling 150 tons of slime, or 6c. per ton.

2. Power.—The principal divisions are, the 6-in.

centrifugal, the 4-in. centrifugal, the vacuum-pump, and the service-pump for supplying the tank used to furnish hose-pressure for sluicing out the residue. The water used for filling the box and for throwing off the cake is gravitated into the plant and uses no power.

The 6-in. centrifugal makes 1,440 r.p.m., and when running takes 25 h.p. During one operation of the filter this pump runs as follows:

Operation.	Minutes.
Filling with pulp	12
Maintaining pulp at one level	5
Emptying	12
Filling with solution	12
Maintaining constant level	5
Emptying	12
Filling with water	12
Total	70

The power used is therefore equivalent to 29 h.p. hr. Power, as supplied by the Electric Power Co., costs approximately 1c. per h.p.hr., so the cost of running the 6-in. pump is 29c. for each charge, or 1.54c. per ton.

The 4-in. centrifugal pump makes 1,600 r.p.m. and uses 10 h.p. During one operation it runs 34 min., equal to 6.5 h.p.hr., giving a cost of 5.6c. for each charge, or 0.3c. per ton of slime.

The vacuum-pump runs 2 hr. 20 min. for each charge, taking 8 h.p. or 18.6 h.p.hr., equal to 18.6c., or 1c. per ton.

The water-service pump runs about 10 hr. per day, using 3 h.p., or 30 h.p.hr., which, divided over 150 tons of slime, gives a cost of 0.2c. per ton.

Thus the total cost of power, per ton of slime, is as follows:

	Per ton.
6-in. pump	$0.0154
4-in. pump	0.0030
Vacuum-pump	0.0100
Water-service	0.0020
Total	$0.0304

3. Repairs.—The only repairs of any consequence are those to the 6-in. pump. About once a month this pump needs:

1 pair of liners	$2.00
1 disc	3.35
1 shaft	1.80
Mechanic's labor (2 hr. at 50c.)	1.00
Total	$8.15

This for 4,500 tons gives a cost of 0.2c. per ton. The running expenses will be:

	Per ton.
Labor	$0.0600
Power	0.0301
Repairs	0.0020
Treating leaves with acid	0.0150
Total	$0.1074

These figures were compiled when only one filter-box was in use; since then a second has been installed, and as one man attends to both, the cost of labor has come down to 3c. per ton, showing a total working cost of about 8c. per ton of slime.

NOTES ON WORKING.—It will be noticed from what has been said about washing, that the practice at Virginia City at this time was to use either a solution-wash or a water-wash, but not both on any given charge. The reason for this was that the particular slime being treated was such that it would not stand being twice exposed to the action of the air without cracks forming in the cake. This, however, is not the case with all slimes, and it is usually found that a wash of solution may first be given and then a further period of water-wash. Where possible the latter arrangement is preferable, because, as a rule, when using water alone it is impossible to give a sufficient quantity for effective displacement without over-stocking the plant with weak solution, which finally has to be run to waste; and the giving of an adequate wash with barren solution, followed by a quantity of water sufficient to compensate for the daily losses in the stock, and thus displacing as much as possible of the cyanide remaining in the cake, generally results in a better saving of cyanide than is obtained by the Virginia City practice. Another method, where it is not possible to give the double wash, is to add to the wash-solution each day just enough water to maintain the balance of stock liquor in the plant; this gives more uniform results than alternating between solution and water, and is sometimes preferable.

With regard to the time necessary for washing the cake, the important point is the quantity of solution that is drawn through it; in a given time this varies between wide limits with different classes of slime. Fig. 6 and 7 are two charts of the results of the wash at Virginia City. There is an interval of two or three weeks between them. In one of them solution alone was used, and in the other, water. The rate of percolation was 18 tons per hour in each case; weight of dry slime, 19 tons; moisture in the cake, 40%. The samples of solution were caught in a trap below the main vacuum-pipe, capable of holding at least 20 assay-tons, which quantity was used for each assay. Fig. 8 shows a similar chart, made at the Butters Divisadero Mines, in Salvador. Here the ore is ground in tube-mills to an agitation product of which about 85% will pass a 200-mesh screen, and the whole of the pulp finally reaches the filter. In this instance the rate of percolation was 28 tons per hour; quantity of dry slime, 18 tons; moisture in the cake, 28 per cent.

When considering the contents of the solution draining from the filter just before discharging, it will be obvious that this assay does not usually represent the soluble gold and silver left in the cake. Where water or barren solution is used for the wash no portion of the residual moisture will assay as high as that which has already come out, and the average of it will be much lower; for example, if the last solution from the cake should assay, let us suppose, 20c. per ton, the moisture remaining behind would probably average only 10c. or less, and as there will be only half a ton of it contained in a ton of dry slime the assay of the residue would be raised thereby only 5c. per ton, an increase that could hardly be detected by the assay methods ordinarily in use. Five cents per ton, however, is 5c., whether it can be shown by the assay or not, so that when fixing the time necessary for washing, it will be well, instead of depending on what is usually known as the 'washed-residue assay,' to give a trial wash of excessive duration once or twice a month, taking samples of the issuing solution periodically and plotting as a curve the figures so obtained; it will then be easy, if the rate of percolation is known, to set the value recovered at any given point against the cost of obtaining it, and in this way to determine the profitable limit to place on the period of washing.

The question of saving cyanide will not enter largely into this matter of wash-duration, because the cyanide can only be displaced by water, and the amount of the latter used, as already pointed out, will be determined by the daily losses of moisture from the plant, and thus cannot be varied at will except at the expense of running to waste weak cyanide solution from some other part of the plant. Several curves showing the progressive elimination of cyanide from the cake have been made, but as they were not consistent with the gold and silver curves made at the same time they are not given here, and the matter is still under investigation.

The following is a table of the time needed (with a

¾-in. cake) for the various operations, taken directly from the filter log-book at Virginia City:

	Hr.	Min.
Filling, and taking on cake	0	45
Removing surplus pulp and re-filling with solution	0	25
Drawing wash-solution through cake	1	15
Replacing solution by water, throwing off cake, discharging, sluicing out, and re-closing doors	0	35
Total time of operation	3	0

The percentage of moisture held by the cake before being detached from its support is from 35 to 40% in this case, though the average for an ordinary slime would be nearer 33 per cent.

The box contains 94 filter-leaves, and each leaf carries about 400 lb. dry slime, giving a capacity of 19 tons at each operation, or 150 tons per 24 hours. With certain kinds of slime the capacity of a filter of this size may be as much as 25 tons per charge, making 200 tons or more per 24 hours.

The consistency of the pulp fed to the filter has an important bearing on the efficiency of the latter; the thicker it is, the better it will suspend fine sandy material and form a homogeneous mass giving a uniform cake, and also the less time it will need to form the cake and therefore the greater will be the capacity of a given filter-unit in a given time. Of course, there is a limit in the consistency, beyond which the thickness would cause trouble by clogging the pipe-lines, and a useful point to aim at is a specific gravity of from 1.3 to 1.4.

At the start there was one point in connection with the working of the filter that was not apparent. It was found that after a few months the permeability of the leaves began to grow less, thus necessitating a longer time for loading and also for passing the wash. After a careful examination, it was traced to a formation of calcium carbonate in the fibre of the canvas and more especially on its exterior surface. This was found to be easily removed by immersing the leaves in a dilute solution of hydrochloric acid. A rectangular wooden vat was prepared capable of holding 7 or 8 leaves at a time, and this was filled with a solution containing about 2% commercial muriatic acid in water. Seven leaves are removed each day, their places being filled by spares. They are placed in the acid bath and allowed to remain for about six hours, at the end of which time they are removed, drained, and placed in a water-tank to stop the action of the acid. In this way each leaf is treated about twice per month.

If this is not sufficient to restore the leaves to a perfect working condition, the strength of the acid may be increased to 5 or 6%, and a vacuum arrangement attached to them for drawing the solution through the fibre repeatedly, until all the deposit is removed. Instead of continually adding acid to re-strengthen the bath, it is better to turn the whole liquor to waste at short intervals, because it is liable soon to get charged with salts, which, if not properly washed out from the leaves with water, may be precipitated in the fibre of the canvas when next it comes in contact with alkaline solution.

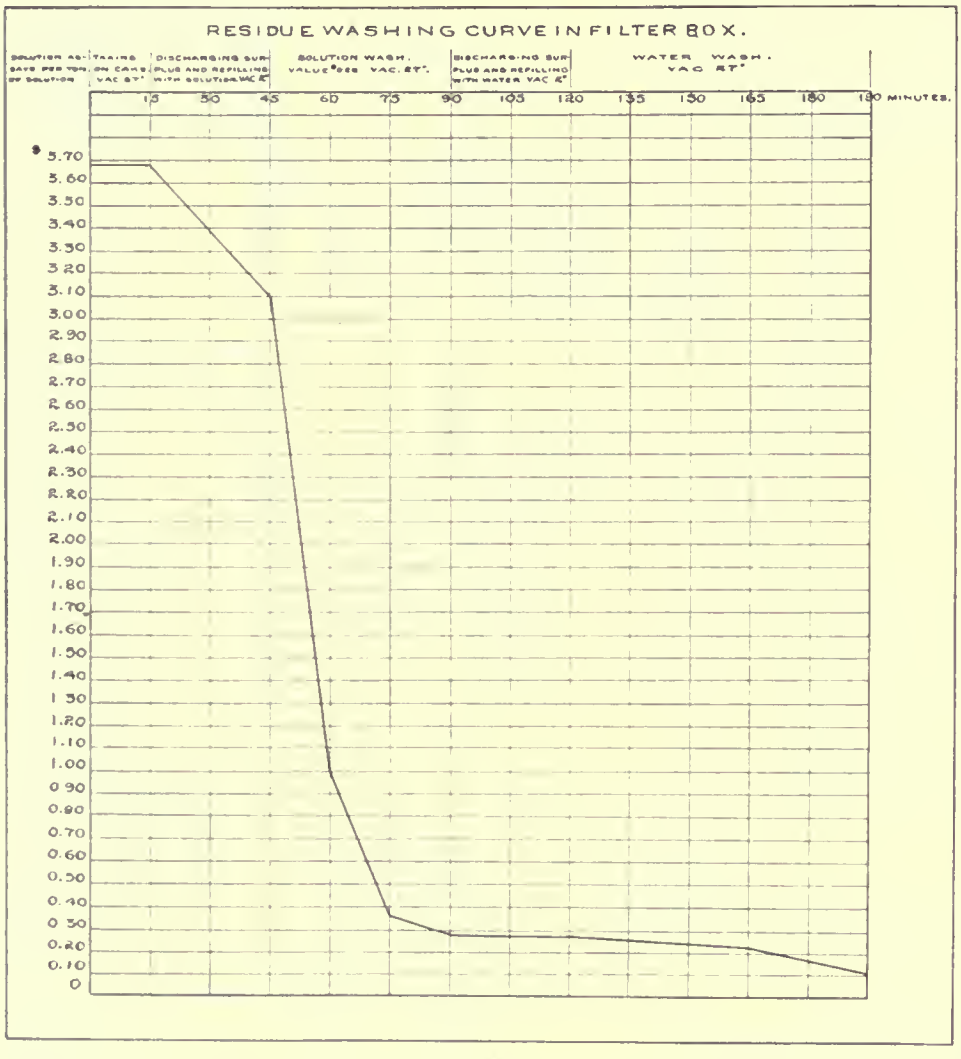


Fig. 8.

To get the highest efficiency from this filter it is important to make the transfer of pulp and solution as rapidly as possible, and this for two reasons: (1) It materially increases the capacity of a given filter-unit and thus decreases the working costs per ton of slime in the item of labor, and (2) it lessens the liability of the cake to crack when exposed to the air, and in the case of slime that has an exceptional predisposition to crack, it renders it possible to give a double wash, of solution followed by water, when otherwise only a single wash could have been applied.

For a rapid transfer of the pulp and solution the gravity system of filling and emptying the box gives excellent results. The general arrangement is shown in Fig. 9, though there a water-wash only is provided for. Usually a second vat at the level of *C* is provided to receive the surplus solution, and also a third vat for surplus water where the double wash is given and where the water is sufficiently valuable to be saved for re-use. The method of working is to fill the box with pulp by gravity through two or more 6-in. pipe-lines from the feed-vat above; then after taking on the cake to let out the surplus through the discharge gates into vat *C*, which has a light stirring gear to keep the slime in suspension while it is being thrown back by a 4-in. centrifugal pump to the feed-vat above. The same process is then repeated with

the wash solution, and again with the water if necessary, each in turn being thrown back to the higher level by the same 4-in. pump. In this way the box may be filled in 4 or 5 minutes and emptied in 3 minutes, so that the cake is exposed to the air only about 8 minutes for each transfer; this is a great advantage where a slime shows a tendency to crack. The arrangement is chiefly applicable where the mill-site is on the side of a hill; for level sites the pump-system is usually more suitable. By the latter, of course, results similar to those of the gravitation system may be obtained by using a sufficiently large pump and pipe-line, but where the site is favorable to gravitation this has the advantage of a rapidity of transfer without the sudden switching on and off of a heavy load at short intervals with its attendant strains on the source of power and the machinery in general, the power used being comparatively small in amount and evenly distributed over a long period of time. The method has been in use at the cyanide plant of the Butters Copala Mines, in Sinaloa, Mexico, for over 12 months and has given entire satisfaction.

The Butters patent filter is now well past the experimental stage, and its advent may be said to mark the beginning of a new era in the history of ore-slime treatment, and to open up possibilities unknown a few years ago. The time may even be not far distant when slime from gold ores will be treated by cyanide solution directly in the vacuum-filter, so that all the expensive agitation and decantation machinery now in use can be discarded.

It would perhaps be too sanguine to hope that the slimes of silver ore may also be treated in the same way in the near future, because, as far as our present experience goes, such ore requires a much longer time in contact with cyanide than would be practicable in any filter, but as soon as some means is found of accelerating the solution of silver in cyanide, then there is little doubt that agitation and decantation will give place to treatment by leaching in vacuum-filters.

A DISPATCH from Ottawa, Canada, states that the Georgian Bay Canal Commission has practically completed, at a cost of some $600,000, a thorough survey of the proposed 21-ft. waterway from Georgian bay to Montreal by way of the French river, Nipissing, and Ottawa river. The engineers of the commission have not compiled a final estimate as to the whole cost of the canal, but from information now available it is stated that the total expenditure required for a continuous and easily navigable waterway, with a minimum depth of 21 ft. from Georgian bay to tidewater, will be close to $105,000,000. It is said that the canal will shorten the distance from Fort William, on Georgian bay, to Montreal by over 400 miles. It is estimated that with the completion of the canal there will be 500,000 h.p. available along its course—almost as much as is available at Niagara. With so much cheap power available and with its great resources of iron ore and timber, the Ottawa valley is expected to become one of the greatest manufacturing centres of the continent. It will be linked with the system of water-transport that has done so much for the regions bordering the Great Lakes.

RECOVERY OF COPPER FROM SCRAP.—A comparatively new industry has sprung up in the refining of nonferrous scrap metal and the present high prices asked for all metals of this class has led to unusual activity in the scrap market. Scrap producers are anxious to realize on their waste metal and competition is keen for the purchase of raw material by the refiners. Copper is getting its due share of attention, and some care is necessary now in handling the ever increasing traffic in copper and brass scrap. Brass and other alloy scrap is recovered by re-melting in crucibles with new metal. Fine particles of brass, such as occur in ashes, skimmings, and sweepings, are recovered by a system of washing and jigging.

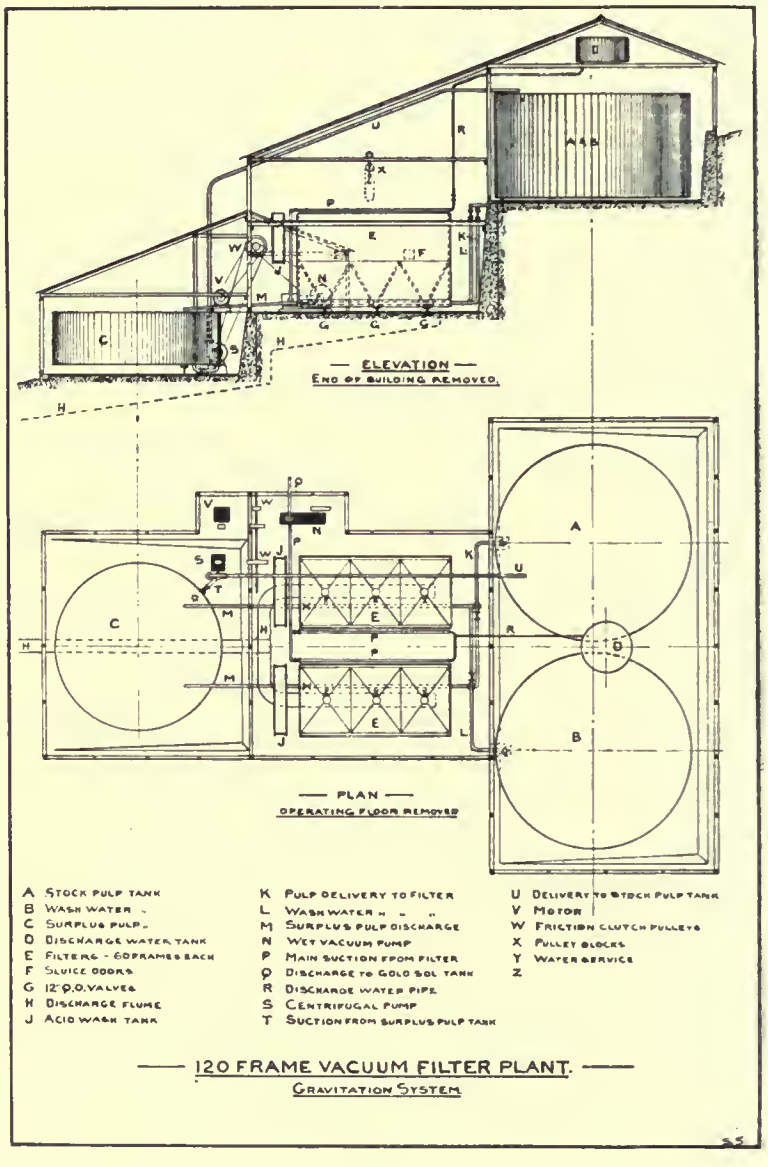


Fig. 9.

Concentrate obtained from jigging processes is smelted in a reverberatory furnace or melted down in crucible or oil-burning furnaces and cast into ingots. Copper scrap is treated differently, according to the character of the material. The copper may be in the metallic state, as in trimmings from copper sheet, borings, grindings, punchings, etc., or it may exist in chemical combination with some other element, as in copper scale or blue vitriol. Metallic scrap copper may be melted in reverberatory furnaces of similar design to those used in the copper mining districts. The slag skimmed off consists of impurities originally contained in the charge, and combinations of copper with oxygen and the fire-brick lining of furnace. The slag may contain from 30 to 70% copper, which is recovered by smelting in a cupola or small round water jacketed blast-furnaces.

Henry G. Hanks.

Henry G. Hanks, who passed away on June 11 at the Mininger Sanitarium, Alameda, was one of the old-time citizens of San Francisco. Born at Cleveland, Ohio, on May 12, 1826, he early gratified his desire for travel by shipping before the mast as a sailor and so visited India and South America. He came to California in 1852 and was prominently identified with the early history of San Francisco.

It was in his chosen field of geology and mineralogy, however, that he achieved most success. He was associated with J. M. Hutchings, of Yosemite Valley fame, in the Owens River country in 1863 and 1864. As Deputy U. S. Mineral Surveyor he laid out the town of San Carlos (near the present town of Bishop Creek), erected a five-stamp mill, and had charge of the operations of a company engaged in the development of that region. Returning to San Francisco in 1866, he established the custom assay-office and laboratories still conducted by his son.

At the Pacific Chemical Works at North Beach, about 1876, he was one of the first to refine borax, then produced from the waters of Clear Lake. He was appointed to represent California at the Paris Exposition of 1878 and had charge of collecting and arranging the valuable mineral collection sent there from this State at that time. He was later placed in charge of the entire mineral exhibit of the United States at this exposition. Prominent in the movement to organize a State Mining Bureau, he was appointed first State Mineralogist in 1880, a position which he held for six years. He compiled and published the first six reports of the Bureau. The second Annual Report dealt largely with the question of hydraulic mining in the State, and appeared just at the time of the injunction restraining such mines from working. The third Annual Report was a monograph on borax. In the fourth Annual Report he made up the first complete list of minerals found in California with the localities of each, their commercial value, and uses.

He was a frequent contributor to technical journals and to the proceedings of many scientific societies. He was one of the early writers on 'rusty' gold in company with the late Melville Atwood. The mineral Hanksite (a sulpho-carbonate of soda, which he had discovered in the borax marshes of the San Bernardino desert) is named in his honor. During his residence in California he accumulated three collections of minerals. The first was purchased by the late James Flood and presented to the State University. The second passed into the hands of the Kimball brothers of San Diego, and the last was destroyed at his residence in the fire of last year.

Mr. Hanks early commenced the accumulation of a library bearing on geology, mineralogy, chemistry, and metallurgy. As he grew older and retired from the active cares of business, he was able to give more time to this work and his library (consisting of over 4,000 volumes) was undoubtedly one of the most complete of its kind on the Coast.

Among the more important of his published writings may be mentioned his 'Notes on Pacific Coast Earthquakes,' 'Deep Channels of the Pacific Slope,' a monograph on 'Magnesite,' historical articles on 'Gold' and 'Mercury.'

Mr. Hanks had visited Europe several times and was personally acquainted with many scientific men on the other side. He was a Fellow of the Royal Geological Society and of the Royal Microscopical Society of England, had received a certificate of merit from the Ecole de Mines of Paris in connection with work done at the Exposition of 1878.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A servant who continues to work after discovering the defect or danger incident to such work, or where such danger is patent and open to ordinary observation, assumes the risk of consequences and continues to work in such place at his own peril.

Pioneer Min. &c. Co. *v.* Smith, (Ala.) 43 So. 561. (April, '07).

The general rules as to the relative duty of master and servant as to knowledge of danger applies to miners and mine owners. But in all such cases they do not stand upon an equal footing, even when they have equal knowledge of the danger. The position of the servant is one of subordination and obedience to the master, and he has the right to rely upon the superior skill of the master, and he is not entirely free to act upon his own suspicions of danger. Where a servant, being ordered to work in a particular place, obeys and is injured, he will not be held to be guilty of contributory negligence, unless the danger is so glaring that a reasonably prudent person would not have entered into it.

Pioneer Min. &c. Co. *v.* Smith, (Ala.) 43 So. 561. (April, '07.)

A defect in the roof of a mine entry was reported to the mine owner, who thereupon attempted to remedy it, and then assured the miners that the roof was no longer dangerous. A miner while at work in the mine was afterward killed by the falling of that part of the roof where the repairs had been made. It was held that the failure of such miner to examine the roof, after the repair, was not negligence as a matter of law, where it was not shown that he knew of the danger, or that the defect was open and glaring to ordinary observation.

Pioneer Min. &c. Co. *v.* Smith, (Ala.) 43 So. 561 (April, '07.)

One mine owner cannot make the adjoining land subservient to his own as a mere matter of convenience to himself for dumping the waste from his mine.

White *v.* Lansing, 103 N. Y. S. 1040. (May, '07.)

The laws govering the location of placer claims on the public domain apply with equal force to the location of oil claims.

Woolfskill *v.* Smith, (Cal.) 89 Pac. 1001. (March, '07.)

Public lands, upon which an oil company had drilled two artesian wells and which was then abandoned, reverted with such wells to its original status as unoccupied and Government land.

Woolfskill *v.* Smith, (Cal.) 89 Pac. 1001. (March, '07.)

A hoisting engine used at the top of an incline for the purpose of drawing rock and coal-cars to haul material from the mine, though outside of the mine, was a part of such mine, under the statute of Illinois, which made it the duty of the mine manager to see that all dangerous places above and below were properly marked, and danger signals displayed when required, and the mine owner was liable for injury to a miner for failure to have such hoisting engine inspected and marked dangerous as required by the statute.

Spring Val. Coal Co. *v.* Greig, (Ill.) 80 N.E. 1042. (April, '07.)

An option given on coal underlying certain land without consideration, is completed by an acceptance before the option was withdrawn.

Murphy *v.* Thompson (Ky.) 101 S. W. 964. (May '07.)

The courts are liberal in granting injunctive relief in mining litigation, in order that neither party may gain any advantage over the other, during such litigation, by force or violation.

Salford *v.* Fleming, (Idaho) 89 Pac. 827. (April, '07.)

Old and New Methods at Guanajuato, Mexico.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Reference has been made to the milling practice of the Guanajuato Reduction & Mines Co. in speaking of the Bustos plant. It deserves further consideration. Although the property was acquired in January, 1904, it was not until February, 1905, that it was decided to build 80 stamps, rushing the erection of five of them so as to afford experimental data during the construction period. Many tests, on a large as well as a small scale, had already demonstrated that a high extraction of both silver and gold could be obtained from the ore by cyanidation, and the experimental plant became of great service in testing ores from different parts of the company's properties, as well as to suggest the detail manipulation best adapted for the main plant, then under construction. The mines are a mile from Guanajuato, and there are no streams available for disposal of the tailing; nor is there the space necessary for accumulating residue on a large scale. It became necessary to discharge the tailing into the main stream of the district one mile from the mines,

Pipe for Conveying Tailing.

and this meant the transportation of all ores through the heart of the City over an expensive railroad system, or the complete separation of the stamp-mill from the cyanide plant, the latter to be placed upon the main stream.

The Homestake system, of conveying the tailing in a cast-iron sewer-pipe, was adopted; it is an 8-in. water-pipe of bell and spigot type, asphalted, laid for its first few hundred feet at a grade of 3%, then flattening to 2¼%. As it was desirable to settle and return for re-use as much of the water coming from the concentrators as possible, allowing the thick pulp only to pass through the pipe, and to determine to what point such thickening was possible, several hundred feet of the pipe to be employed in this work were put together and laid out upon the actual grade. Arrangements were made to circulate any given quantity of sand, crushed in the stamps of the experimental plant already installed, through this pipe-line at any desired degree of dilution. Pulp was first tried at a normal dilution of 8 of water to 1 of sand, just as it came from the tail of the concentrator tables; the water was then decanted by successive steps, thickening the pulp, and several runs were made under these varying conditions. It was desired to remove a maximum of one-half of the original water, and in the experiments the 8 to 1 pulp was reduced to 2.5 to 1, and so successfully that not only was the pipe not clogged with sand, but the pulp at that thickness had such rapidity of flow that it readily carried nuts and other heavy objects without interrupting the stream. Tests made by Mr. Carlos Van Law prove that pulp which has passed through a 30-mesh screen, with water in the proportion of 7½ to 1, will flow through a launder of square cross-section, made of rough boards, set on a grade of 1½%. With a V-shaped wooden launder, such pulp will flow at less grade and with less water. The area of the wet perimeter is the factor.

This problem settled, the process was outlined as follows: The ore is transported over a railroad from the mines in hopper-bottom cars, which discharge into a large bin at the crusher plant. It is then passed through a No. 5 D. Gates crusher to 2-in. size, discharging over a picking-belt for removal of waste, then re-crushed by a short-head No. 4 Gates crusher to 1-in. ring, then removed by conveyor-belts to the mill-bins, where it is distributed by cars, this (owing to cheap labor), proving more economical than the use of a system of conveyor-belts over the top of a bin with automatic trippers. The mill-bin has a capacity for five days, which, together with the large bin at the crusher plant, affords sufficient storage of ore.

The ore is then crushed under eighty 1,050-lb. stamps of Allis-Chalmers make. The mortars are set on a concrete foundation, the anvil-block being cast as an integral part of the mortar. The latter has a steel liner, two inches thick, but there is 13.5 in. of metal below the liner. Between the anvil-block and the concrete a quarter-inch sheet of rubber is spread. The mortar has a broad base—36 in. wide—provided with strong ribs at the sides.

The 30-mesh pulp resulting from the stamping is concentrated over Wilfley tables, a considerable amount of middling produced being removed for re-grinding in an Abbé tube-mill and subsequent treatment over separate concentrator tables. The tailing from all the machines drops into concrete launders and passes to the cones, where about half of the water is removed for use in the mill. The thickened tailing then enters an 8-in. cast-iron pipe, laid on the grade above mentioned, and goes to the classifiers in the Hacienda Flores, situated upon the main channel of the Guanajuato river. The classifiers are all of the Homestake type, two sets of cones being used, the lower one taking the bottom product of the upper. The overflow from both sets of cones goes to the slime-plant, the lower cone having an ascending current of water.

The sand coming from the bottom of the lower cones is distributed, by the Butters & Mein device, into either of two receiving-vats, each of 350 tons capacity. These were planned to serve an ultimate capacity of 500 tons daily, with the slime separated.

The receiving-vats are alternately filled and drained, the discharge being made through bottom gates onto ascending conveyor-belts, which pass over the centre of the line of eight leaching-vats, each of the same size as the receiving-vats. In these a 14-day treatment is given with 0.5% cyanide solution, the sand being then washed and ultimately discharged on conveyor-belts (running under the vats), which deliver either into the river during the rainy season, or to elevated storage-piles during the dry season, to be sluiced during the succeeding rainy season.

The slime from the classifying cones is treated by agi-

tation with mechanical stirring and large centrifugal pumps, which draw from the bottoms of the vats and discharge over the tops, the total time of treatment being four days. After the final wash the slime is pumped into settling-vats 30 ft. high, where a further decantation occurs before the slime is discharged, with a very small percentage of moisture, into the river.

The entire plant, both the stamp-mill and cyanide annex, is designed so that it can be doubled, when the stamp-mill will take a back-to-back form, 80 stamps with their concentrators being on either side of the bins. The classifying-cones and the receiving-vats of the cyanide annex are of sufficient size already for a 500-ton plant, it being necessary only to add another line of eight leaching-vats and the corresponding slime-vats to bring the cyanide plant to the larger capacity mentioned.

For roofing, corrugated galvanized iron on a steel frame is preferred. As there is no load of snow to fear, it is possible to use a light roof-truss. The native tile is cheaper, but it requires a heavier construction, and does not afford as complete protection. The Northerner will remark the lavishness of the masonry about the mines and mills in Mexico. It is the cheapest kind of construction and the native wood is usually poor; it will twist and untwist as the dry and wet seasons succeed each other, making it an unsatisfactory structural material.

At the time of my visit there were 120 stamps in operation in the Guanajuato district, and there were 205 tons being treated daily by cyanidation and 25 to 30 tons by *patio*. Thus does the new drive out the old. In 1887 there were 34 *patios* at work; now there are only two.

In regard to cost in the *patio* process, I have the following data from the Hacienda de San Julio at Pachuca:

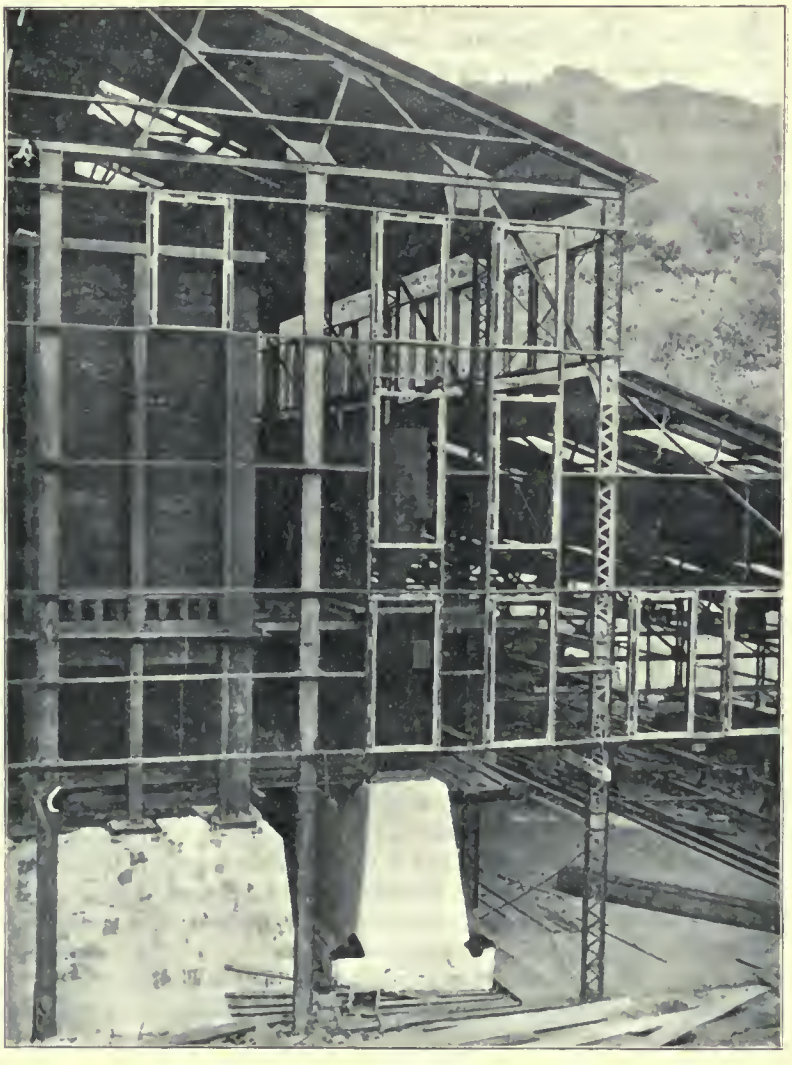
	Pesos.
Crushing, to pass 60-mesh in Chilean mills, with overflow discharge	3.60
Maintenance	0.50
Salt, 5%, or 10 kg. per ton	1.75
Copper sulphate. Loss, 0.5%	1.25
Mercury. Loss, 1½ kg. for each kilogram of silver	4.38
Transport from the mine	1.08
Total	12.56

The ore is bought on the dump, therefore the cost of transport is included. Salt costs 35 *pesos* per ton; copper sulphate, 250 *pesos* per ton; and mercury, 3.41 *pesos* per kllo. The average losses for the year were 1.18 to 1.50 kllo. per kilogram of silver extracted; the loss of silver being 6.13 to 10.92% on the clean ore, and 15.83 to 29.13% on the galena ore. The *patio* process waits on the completion of the chemical reactions, and it is therefore continued until extraction ceases. Time is not considered; in winter it requires 20% longer by reason of the lower temperature of the air.

At Parral, in Chihuahua, with the Russell process, using hyposulphite, the cost of lixivintion and roasting is 11 *pesos*, but the recovery is not as high as it is with amalgamation in the *patio*, where the cost is 11 to 14 *pesos*, varying according to the manganese content of the ore.

At Pachuca, by Mexican methods, the cost of mining and sorting ore nmounts to 15 *pesos* per ton; the transport to the *patio* and the treatment there makes a further cost of 14 *pesos*, not including losses or the expense of marketing the product. By stamp-milling, pan amalgamation, and concentration, the cost at Guanajuato was 8 *pesos;* and now by stamp-milling and cyanidation the cost is 5.85 *pesos*. That of mining and development is 3.50 to 4.50 *pesos*, so that the total present cost is about 10 *pesos*, or $5 per ton.

At the time of my visit there were about 200 men, women, and children in the Anglo-American colony at Guanajuato, the American element predominating. Of the 125 men employed, 75 to 80 were technical men, of good training. This made a strong piece of mental machinery for industrial development.



Bustos Mill, When in Course of Construction.

BRAZILIAN SAND.—Contrary to the impression which seems to exist in the United States, there has been no increase in the export tax on monazite in Brazil, although the practical effect of the course of the business in this country has been such as to lead to conditions amounting to an increase. The federal authorities continue to charge about 50% on exports, or rather they allow the person handling the sand 50% of the sale value, taking the balance. In Bahia the tax remains at 27% ad valorem plus $4.85 per ton specific export tax. In Espirito Santo the tax has been 20% ad valorem plus £1, £2, or £3 per ton specific duty, depending upon whether the exporter, a third person, or the Government owns the ground from which the sand is taken. The State legislative assembly of Espirito Santo has been debating the question of an increase in the tax imposed by that State.

Pan Amalgamation.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. BANGLE.

As this is a process that in practice gives results generally lower than expected from tests made before actual milling a few preliminary remarks will be in order. In the first place, laboratory tests on a small scale are frequently executed by grinding the pulverized ore in a rough porcelain mortar, using a great excess of mercury, which is unusually clean as compared with that used over and over again in the mill, the surface of which shows it to be contaminated by chlorides, refractory sulphides, oxides, grease, etc. The porcelain mortar does not fulfill one of the important conditions obtaining in practice because it does not act chemically upon the ore, being like a stone *arrastre* in that respect, contributing no iron salts to the charge as an iron mortar would.

It is a known fact that the old Mexican stone *arrastre* is slower but surer in many instances than the modern pan, for the Mexican valued a good cheap extraction rather than a high one with a faster and more expensive machine, time being the least of his troubles. The *arrastre* served him for grinder, pan, and settler, all combined in one machine. A pan is not a grinding machine in the full sense of the word, yet some grinding is necessary, unless thorough sliming has been accomplished previously. The first runs, after an installation of the pan process, are usually short ones, due to a certain amount of experimenting being necessary. Leakage also tends to shorten them. Up to a certain point, invariably, some improvements can be made after the first trials. At Los Grados, in Guerrero, great care was taken to have every joint of the pan and settler-bottoms fit absolutely, the bottoms being sectional for mule-back transportation and necessitating greater care, therefore, to give both strength and tightness. Even then there was a leakage of mercury, although every joint of the sections had previously been smoothed by emery paper and cleaned with petroleum and oil, and every bolt tightened two or three times with a wrench. If there is the slightest opening for leakage, mercury will find it. It is possible to calk the pan by using thin pieces of copper sheeting as wedges, but the loss will in time be remedied by an amalgam filling from filtering or by its being pressed in, forming a hard cementing material.

The latest style of pan and settler is made with overhead shafting, pulleys, and belting, as against the older type of underneath beveled gearing. The former type allows the pans to set closer to the floor, and the working parts are at all times in sight of the operator. The sills for such pans and settlers are frequently laid directly on the ground, neglecting to leave a cement floor beneath, or even space enough for a man to crawl under them. Observe these precautions; it will be a convenience and save your mercury. It will eliminate the doubt whether a loss is from flouring or leakage. For the first two days run we had a 'loss' of four pounds of mercury per ton of ore, due to leakage and flouring. The leakage was remedied to a large extent and much mercury was recovered, until the total loss (including retorting) was only 1½ lb. per ton and that due largely to flouring. Some flouring will occur even under ideal working conditions.

Books on the subject rarely explain how much of the several indispensable chemicals are to be used in the process; they are merely content with the final figures as taught by experience. It may prove equally interesting, if not profitable, to quote a specific case by which I was guided at Los Grados. I shall first give the three principal reactions underlying the process. If they can be regulated, one need not bother with the innumerable minor reactions that take place under as many changing conditions.

1. $2NaCl + CuSO_4 = CuCl_2 + Na_2SO_4$
2. $CuCl_2 + Ag_2S = 2AgCl + CuS$
3. $AgCl + Hg = HgCl + Ag$ (soluble in the excess Hg used in the pans).

It will be understood that the process is used to decompose the various silver minerals, which are suphides, or even more complex, such as sulph-antimonides and sulph-arsenides of silver, but which by heat and chemical reactions are somehow finally made to act as Ag_2S. If one has AgCl, native silver, or free gold in his ore, he need not worry about good results, and some other processes might be much better. The pan-amalgamation process gives the best results for silver rather than gold, just as the cyanide process gives best results for gold rather than silver. If the process is to be used on ore containing much gold, inasmuch as the chemicals retard the amalgamation of gold, a previous use of copper plates may remove most of the nobler metal, as they catch relatively more gold than silver, as a rule.

Example: Tailing to be treated, having passed a 40-mesh screen, assayed 1,500 kg. Ag per ton.

A charge of two tons of raw tailing is put into each 5-ft. pan, hence take double the quantity calculated below on one-ton lots. The figures under the formula represent molecular weights.

$$2NaCl + CuSO_4 = CuCl_2 + Na_2SO_4$$
$$117 + 159 = 134 + 142$$
$$CuCl_2 + Ag_2S = 2AgCl + CuS$$
$$134 + 247 = 286 + 95$$

Hence it is seen that it takes theoretically 1,591 parts of copper sulphate for every 216 parts of silver in the ore, to form the chloride of silver.

$$216 : 1{,}500 :: 1{,}591 : x$$

Hence use 1.1 kg. $CuSO_4$ per ton of ore as the minimum allowable for silver alone.

In a similar manner 1.1 kg. $CuSO_4$ will require 0.9 kg. salt. But the $CuSO_4$ is soluble and uses up the salt, and if there are other soluble compounds, such as sulphates, etc., especially in roasted ore, they may *one* or *all* require salt. I confess this is the weak point in deciding how much salt, and the minimum to be used can be determined only by experiment. So it is evident that any experiments of this kind are more valuable in the saving of chemicals rather than in improving extraction. It is safe to start by using an *excess* of 10 kg. salt per ton of ore, above that calculated for any copper sulphate added or formed in the roasted ore. The amount of soluble sulphates in an ore may be easily tested by the addition of barium chloride. If anyone believes he can ascertain what reaction is influencing his process, he should look for other solubles, bases, salts, etc., as they are easily found by the simplest tests.

Salt is apparently the least harmful chemical one could use in excess in his charge. It might, in great excess, dissolve AgCl, but the mercury would precipitate it and amalgamate it. $CuSO_4$ is about the worst thing added in excess, as it causes flouring, and if it does cause copper to enter the amalgam, it sickens it and makes it brittle, causing it to slime by friction in the charge. To see if there is a waste of $CuSO_4$ by the precipitation of copper in the amalgam, test a small piece by dissolving in strong nitric acid, and add an excess of ammonia. It should show a trace of copper. If it does not, it proves that there may be a lack of $CuSO_4$ for satisfying something more necessary. If it is believed that too much $CuSO_4$ has been added, it can be taken up by adding lime, the reaction being:

$$CaO + H_2O + CuSO_4 = CaSO_4 + Cu(OH)_2$$

This will prevent the copper from further entry into

the amalgam, for the lime will attack the $CuSO_4$ before attacking the chloride. It will stop flouring, if due to oil, and it will have a tendency to thicken the charge, and also to heat the charge if cold. In the isolated pans I always added it five minutes before discharging, because for some reason it seemed to cause a diminution of floured quicksilver. In the Boss process it could be added to the last of the series of pans and have the same effect. The quantity I added was enough to cause the charge to have the peculiar smell of a limy solution and to cause foam to appear on the surface of the solution of the settler, CO_2 being evolved. From the above equation it is seen that it takes 0.4 kg. CaO to neutralize the 1.1 kg. $CuSO_4$; hence a slight excess is needed. It is so cheap, and ordinary burned lime is so impure that an excess is likely to be added. (Roasted ores may be alkaline if they contained $CaCO_3$, as the result of roasting will produce some CaO.) The use of lime will frequently do away with chemicals such as KOH, NaOH, KCy, zinc amalgam, etc., used to clean the mercury. Flouring seems to be worse as the sulphides increase. At Los Grados only one-third of the sulphides are removed by a Frue vanner when everything is working well, and if the amount of sulphides in the ore remains the same and the vanner removes less, there is a perceptible increase of floured mercury, as found by testing with the horn spoon. Occasionally flouring will continue until discharging time, and it may sometimes be prevented by lowering the muller during the last few minutes. This seemed to work well when even the lime had but little effect. According to usage in pan work, no grinding is done after the salt and $CuSO_4$ are supposed to have had time enough to do all the chemical work preparatory to adding the mercury. Perhaps it can be explained by the evidence of the horn spoon; collect a little of the floured, or sickened mercury, by washing a portion of the pulp. It will not unite of its own accord, but press or rub it with your fingers, and it readily unites.

Too fast a motion of the muller will beat the drops of mercury into minute globules. If the speed is not sufficient, the charge will not buoy up particles throughout the charge. Too thin a pulp is just as bad for buoying up the particles of mercury. If the charge is too thick, flouring will result from friction. A happy mean of speed and thickness of pulp must be chosen, the speed varying from 65 to 85 rev. per min. A good amalgamator ascertains how thick his pulp is by trying how gritty it feels between his fingers, by the sound of the ripples produced, by taking a dip with the horn spoon and examining the amalgam or mercury, or even by sight.

Steam dilutes the charge from condensation. The settler has a continuous discharge in the Boss process, but in the case of isolated pans and in the presence of a little sand the settler must continue running for a while after receiving its tailing from the pans, and allow the fine particles of mercury and amalgam to settle. At Los Grados an 8-ft. settler is used for two 5-ft. pans. The settler has three discharge-holes at different heights from the bottom, the lowest one being 8 in. from the bottom. In discharging from the upper holes, no floured mercury, or at most, a trace, escapes, if at the time of discharging from the nearest hole below the surface of the solution, no grit is felt between the fingers, the arms making 14 rev. per min. When the lowest hole is discharged, some floured mercury is always found and such tailing must be caught. Heavy sand usually collects slowly in the bottom of the settler, largely on account of some of the battery screens having worn away unevenly. This sand also contains a large percentage of sulphides and is valuable.

What was said about the number of revolutions per minute for the pans, applies in principle to the settler, especially where everything has not been thoroughly slimed, and in using isolated pans. Even if a sandy tailing is to be treated, roasting helps to slime the tailing by causing the grains containing sulphides to break open and makes even the minute particles of sulphides become brittle and porous after oxidation. No matter how much water is used in the pans, the settler requires a great excess to allow all particles of mercury and amalgam to settle. Use as little water as possible in the pans, all other things being considered, because the less dilute the charge, the more concentrated it is chemically; the steam to heat it will be less, and it may be found that the time of treatment will be shortened.

A good concentration is advisable before amalgamation because not only do sulphides cause a loss by flouring the mercury, but because a nasty matte will often be formed on the top of the melt in refining. As the concentration at Los Grados is poor, most of the matte is caused by sulphides being ground into the hard lumps of amalgam found in the pan and settler-bottoms (roasting has solved the problem to some extent, but there are times when there is a scarcity of roastermen and *peones* to cut cord-wood). The matte here runs one-fifth of the value of the bullion itself and the resulting bars have a dirty coating in spite of careful refining (the coating being matte and not slag).

The use of plenty of mercury in pans and settlers helps to dilute these hard lumps, aiding impurities to rise to the surface so that they are swept away. An excess of mercury is also as necessary as an excess of reducible litharge in a crucible assay, as it causes more particles of mercury to come into contact with unsettled and minute pieces of amalgam. If a settler is provided with a mercury trap not plugged on the inside, and too little mercury is kept in the settler, sand will appear with the mercury when strained, appearing just as matte or speiss appears in the siphon of a blast-furnace lead-well, if too much lead is removed. In a small remote mill the supply of mercury may at times get so low that we must begrudge a sufficient supply in the settler to allow it to have an automatic discharge of mercury to the strainer. This has happened at Los Grados, so we put an inside plug in the settler and, a little after discharging a pan into the settler, the plug is opened enough to allow mercury to trickle into the trap and be used over immediately in the pans. The evil of this necessity is that the inclined groove and outlet of the settler are soon clogged with hard amalgam, and scarcity of mercury requires an early clean-up and retorting. Another reason for using an excess of mercury is that stiff amalgam contains about five times the amount of mercury that it has gold, silver, and various alloys; therefore, use say twenty times the quantity of mercury as the bullion to be obtained.

In some remote parts of Mexico the price of salt is over 150 *pesos* per ton, and mercury is 80 *pesos* per flask, so that the process becomes almost prohibitive. This is so when roasting with salt. We found at Los Grados that 10% salt in a roast gave excellent results and that it was not worth while to roast (if salt were used) with less than 5%. This is probably why at Pachuca (although on the railroad) they prefer to treat the ore raw, using even much less than 3% salt at times, and avoid the expense of roasting and the volatilization resulting therefrom, which might be 5%, even if carefully but thoroughly done.

Extraction varies greatly from apparently insignificant causes, one of them being the very fine particles of iron from shoes, dies, and mullers. At Pachuca the manager of El Progreso, a 50-stamp mill supplied with re-grinding machinery, and the Boss continuous process,

informed me that he had made a test lasting for three days to see what effect this iron had on the extraction. An electro-magnet was placed in the tailing-launder of the concentrator and the iron collected. It was found that the presence of this iron resulted in an increased extraction of 7%. Iron is a precipitant for copper, and this is brought down when the iron is added from outside with an idea that AgCl may be forming, to precipitate the silver. In the Bartolomé de Medina mill at Pachuca they find it necessary to clean their amalgam by placing it in a rotary barrel and treating it chemically to remove copper, as the ordinary amalgam produces extremely low-grade bullion. *Their* explanation of the treatment given in the barrel is: $CuCl_2 + AgCuHg = AgHg + 2CuCl$. In that *hacienda* they used 3% NaCl and 0.4% $CuSO_4$. This looks as if they were using too much $CuSO_4$ for 800 gm. Ag per ton of ore, unless there is something else consuming the copper sulphate.

Extraction by pan-amalgamation seldom exceeds 85% (using the combination process). A well-known manufacturer of mining and milling machinery says in his catalogue describing the modern 40-stamp combination mill of the Eureka Hill Mining Co., erected by him: "There are few mills working raw ore of this class which exceed the saving made, 85%, and it is likely that if they do, they are getting dollars that cost $1.50."

A good idea of costs may be obtained by citing the practice at Pachuca, one of the oldest camps in Mexico. The Spaniards did so much work there that they left a supply of gigantic retorts, which are still being used by large companies (a great number may be seen used as posts about the street corners to protect houses from damage by ore teams; many people suppose them to be Spanish cannons). Here pan-amalgamation, the outgrowth of the *patio* and *arrastre* processes, is as well understood after years of patient and costly experimenting, as anywhere. The several large mills, all using the Boss process, are competitive buyers of ore unusually clean and adapted to the process (all the Pachuca mills are operated by electric power). The ores are highly quartzose, showing a little lime and traces of galena, the best part of the ore being the pyrite concentrated by Standard and Johnston tables. The concentrate is sold to the numerous ore-buyers and shipped by them to the smelters, none being roasted for amalgamation (haulage to the three railroad depots is but a small expense). In general, the mills pay for 70% of the silver and none of the gold. There is a treatment charge of 13 *pesos* per ton, although it actually costs 10 *pesos*. The ores generally being docile require a minimum amount of chemicals; the labor is cheap, being almost exclusively native. The ore is all treated raw, either by stamps, as in the Progreso, or by Chilean mills, as in the Bartolomé de Medina. No plates are used before the concentrators. The ore generally treated contains about 800 gm. silver per ton; it is thoroughly slimed; no grinding in the pans is necessary, therefore, and it simplifies and cheapens the process. The losses in mercury are chiefly from flouring. I was informed that there was a loss of 850 gm. mechanically, for every ton of ore treated, and a loss of 184 gm. chemically, for every kilogram of bullion. In the Progreso mill, the pulp receives six hours of total treatment from the time it leaves the stamps until it leaves the settler. The temperature of the pan-charges is from 50 to 60° C. In the Bartolomé de Medina, using more chemicals, it is from 5 to 10° lower, the aim being to get 45° C., equal to 113° Fahrenheit.

A thorough clean-up is made once every three months in these Pachuca mills. There is but little difference in the grade and quality of the ores amalgamated there. An extraction of 85% is rarely reached. Mercury is fed to only the first of the series of pans, being thrown in by the dipper-full, no precaution being taken to strain it into the charge. It has to be strained anyway to collect the amalgam before being returned. Most of the mercury therefore sinks directly to the bottom and must be picked up by the pulp and scattered through it.

A unit consists of from 5 to 8 pans in a line. All but the first of the series receive most of their mercury by the settling that follows the overflowing of the pulp from the previous pan. The passage between the pans must frequently be kept clear by urging the pulp along by poking it, otherwise it is likely to be too watery. The mercury from all pans but the first, is interchanged with the strained mercury but once or twice a day. A series of more than eight pans is as useless as are too many zinc-boxes in the cyanide process, all the extraction being practically in the first ones. Where the Chilean mills are used to crush the ore, sliming it in one operation, the pulp is run out into masonry vats and overflows into large yards formerly used for the *patio* process. The excess of water is thus easily removed and the pulp is thrown into pan No. 1 and just sufficient water added continuously to give the right consistency. The Progreso mill crushes, by stamps, through a 20-mesh screen and so little wash-water is used that the pulp scarcely flows after passing the mortar-screens. Kinkead mills complete the sliming. About 40% of the slime passing the 20-mesh screen, will pass an 80-mesh screen. In this mill there is no handling of the pulp a second time, as it arrives automatically at the pans with the right consistence for amalgamation.

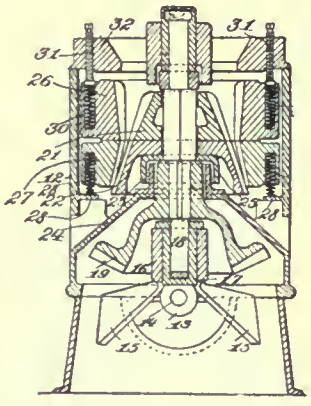
The Progreso is the pride of the pan-amalgamation mills in Pachuca. By able management it has been developed from a mill running not over two hours steadily and with Irish dividends, to a mill working with a high extraction, running every hour of the day, and paying such high dividends that with a part of them the company is erecting an immense cyanide plant to treat Pachuca ores. The Real del Monte Co. is erecting a large cyanide plant, and Pachuca will soon receive a boom. Pan amalgamation is making room for cyanidation, a process better understood now for handling slime and the extraction of silver than formerly. The slime from the Pachuca mills, *patios* and *arrastres*, for the last fifty years, has been caught in the wide valley below the town. Several estimates by different parties show over 500,000 tons that will before long be treated by the cyanide process, as the treatment for them has been successfully solved.

I believe that there are many ores used in the amalgamation process that could be made to yield to the cyanide process and that if the former process is not improved before long it will be in disfavor. A number of people who understand pan amalgamation and have made money by it, say that with all their experimenting and knowledge of chemistry, the proce-s is one the results of which may hinge on any one of the numerous and complicated phenomenal reactions within the pans. They believe, however, that there is some sort of electrolytic action going on, influencing or retarding the extraction and that is quite reasonable, since copper sulphate is an electrolyte. I have never heard of any experiments being attempted to use the muller-ring and pan-bottom as electrodes during some part of the operation. It is certain that the iron would become magnetized and might or might not be more of a blessing than an evil. It would be interesting to learn the experience of others. There is room for more improvement.

MINING AND METALLURGICAL PATENTS.

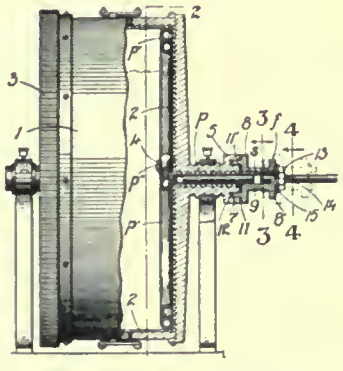
Specially Reported for the MINING AND SCIENTIFIC PRESS.

VERTICAL CRUSHING AND GRINDING MILL.—No. 856,311; Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Company, Portland, Me., a Corporation of Maine.



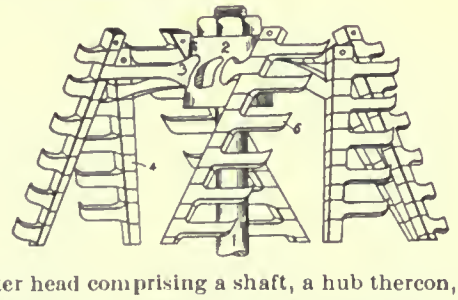
In a crushing machine, the combination with a casing having an open top, of a vertical shaft and rotary crushing elements carried thereby, non-rotating or normally stationary crushing elements elastically supported by said casing for vertical movement relative thereto, said latter elements presenting an interior surface which converges downwardly for a portion of its length and diverges downwardly for another portion of its length, said normally stationary crushing elements being adapted to be inserted or removed through the open top of said casing, and a removable cap for said open top.

CHLORINATION BARREL.—No. 856,384; William J. Armbruster, St. Louis, Missouri.



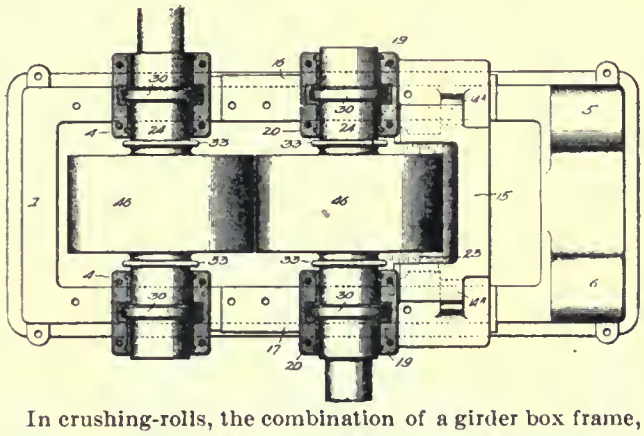
A chlorination barrel having a pulp chamber, a delivery pipe carried by, and rotatable with the barrel, and discharging thereinto, a section of the pipe being above the level of the pulp in the pulp chamber during the rotation of the barrel, and a feed-pipe discharging into the outer end of the delivery pipe.

DREDGER-CUTTER.—No. 856,487; John F. Ollrich, San Francisco, California.



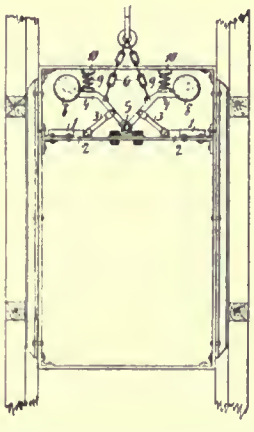
A cutter head comprising a shaft, a hub thereon, arms or spokes radiating from said hub, bars extending from the ends of said arms or spokes in planes oblique to that through the shaft, and cutting device having parts formed integral therewith and resting over and in contact with opposite sides of the bar to protect the same from wear.

CRUSHING-ROLLS FOR ORE, ROCK, AND OTHER MATERIAL.—No. 856,559; Thomas C. Walker, Jr., Denver, Colorado.



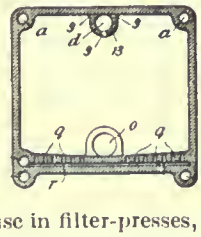
In crushing-rolls, the combination of a girder box frame, having a guideway, a fixed roll, a saddle slidably mounted in said frame and guideway, an adjustable resilient buffer device for said saddle, and a roll mounted in said saddle in crushing relation to said fixed roll, with shafts forming a part of said rolls and provided with journal collars, journal boxes adapted to support said shafts, recesses in said boxes adapted to receive the journal collars of said shafts, and a lining of Babbitt metal in said boxes and recesses around said shafts and their journal collars.

MINERS' CAGE.—No. 856,276; Wilhelm Massing, Borbeck, Germany.



A device for automatically and instantly arresting miners' cages upon the breaking of the hoisting rope, comprising in combination with the cage, the hoisting rope, and the track ledges for said cage; shells (1) provided on the top plate of said cage at both sides of the latter facing said track ledges, arresting catches or bars (2) movably mounted in said shells and provided with upwardly directed sharp-pointed outer ends, links (3) pivoted with one end to the inner ends of said catches (2), a bearing (5) fixed on the top plate of said cage, levers on said frame member (10), said levers (4) and adapted together with said weights (8) to press, upon the breaking of said hoisting rope, said levers (4) downward and consequently said arresting catches (2) outward into said track ledges.

CONTAINER FOR PRESSURE-FILTERS.—No. 856,596; Charles W. Merrill, Lead, South Dakota.



A container for use in filter-presses, provided with a passage having openings therefrom into its interior, whereby a suitable cleansing medium is so projected as to flush the entire interior of the container, and a suitable opening through which the unfilterable component is washed out.

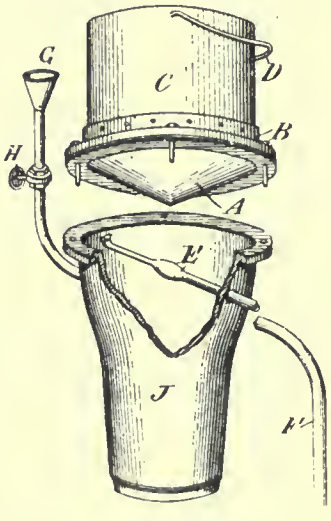
Gasoline Locomotive.

A gasoline locomotive sufficiently small and compact to be used for mine-haulage has been perfected by Fairbanks, Morse & Co., Chicago, Ill. The machine illustrated was designed to suit the reqirements of contractors, industrial plants, etc., but the increasing demand for a machine that would handle coal and ore cheaper than rope-haulage or an electric system led them to modify this type to meet the exacting conditions of mine-haulage. It is designed to operate on either gasoline or denatured alcohol. The mine-

owner will appreciate this, especially if his mine is one of the 'gassy' variety, as alcohol gives absolutely no odor. If no trouble is experienced from gases, gasoline may be used and very little, if any, odor is noticeable. We are informed that they make two sizes, one having a capacity of 10 tons and adapted for gathering purposes, and the other with a capacity of from 20 to 25 tons for main-entry haulage. The gathering locomotive will meet with great favor, as mules are getting to be high-priced and scarce. One of these gathering machines will handle 50% more coal than a mule, and the cost of feed will offset the fuel bill. A descriptive catalogue will be sent on request.

The Lackmann Mercury Still.

Raymond A. Lackmann, inventor of an improved mercury still, furnishes us with the following data concerning the device: The invention relates to improvements for the



rapid distillation and purification of mercury. The distillation is accomplished by using low steady heat. The mercury vapor collects on a conical copper plate, silver plated on the lower side, which forms the cover to the retort; the condensed mercury drops from the point of the cone into an iron spoon, and is conducted away by a small iron or steel spout. Above the cone-shaped plate is a receptacle for holding water, if necessary as a protection for the silver plating, to prevent its expansion and contraction as against the copper, which might result in its peeling. The iron spout dips into a vessel containing water. By means of a funnel, spout, and valve, more mercury can be admitted, and the operation may be made continuous. The still is heated in a small charcoal-burning furnace, which is not patented, and is easily made.

The Weston Multimeter.

The accompanying cut shows the Weston multimeter, manufactured by the Weston Electrical Instrument Co., of Waverly Park, Newark, New Jersey. This is a new form of electrical measuring instrument, which possesses a

wide range of usefulness in the measurement of electrical quantities, the one instrument serving the purposes of a direct-current voltmeter, milli-voltmeter, ammeter, mil-ammeter, ohmmeter, ground detector, and wheatstone bridge. Although the scope of measurements that can be made by this instrument is large, a much higher degree of accuracy is obtainable with it than with any so-called 'universal instrument' known. The device is fully described in Bulletin No. 6 of the company.

Catalogues Received.

THE BLAISDELL COMPANY, of Los Angeles, has issued Catalogue G, on the Blaisdell Pressure Filter.

THE C. W. HUNT CO., of New York, has issued Catalogue No. 072, on Hunt Coal Handling Machinery.

THE LIDGERWOOD MFG. CO., of New York, sends us a catalogue of Lidgerwood Electric Hoisting Engines.

THE BARRIETT ELECTRIC MFG. CO., of Cincinnati, Ohio, is sending out Bulletin 5, on direct-current motors and generators.

THE ALLIS-CHALMERS CO. of Milwaukee, Wis., issues Bulletin No. 1513, dealing with the Christensen portable air-compressor.

THE CRANDALL PACKING CO., of Palmyra, New York, sends us an attractive catalogue and price list of improved steam, ammonia, and hydraulic packings. The publication contains a table showing what styles of packing to use for various purposes and pressures.

Commercial Paragraphs.

DE GOLIA & ATKINS have moved to 1020 Crocker Bdg., from the Kohl Bdg., San Francisco.

THE demand for crushed stone for many purposes, but more especially for concrete construction, is becoming greater with each year, as evidenced by the many large crushing plants now in process of construction. A noteworthy feature in connection with these new plants is the size of the crushers installed, the demand being for machines of extremely large capacity, as for instance, the No. 10 McCully, the capacity of which is from 300 to 700 tons of crushed stone per hour. This size of crusher was first placed on the market a little over a year ago, by the POWER & MINING MACHINERY CO., of Milwaukee, and its popularity was so pronounced that there have been something like 20 or 25 of these machines sold to date.

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